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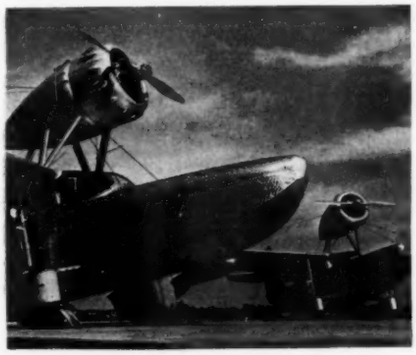

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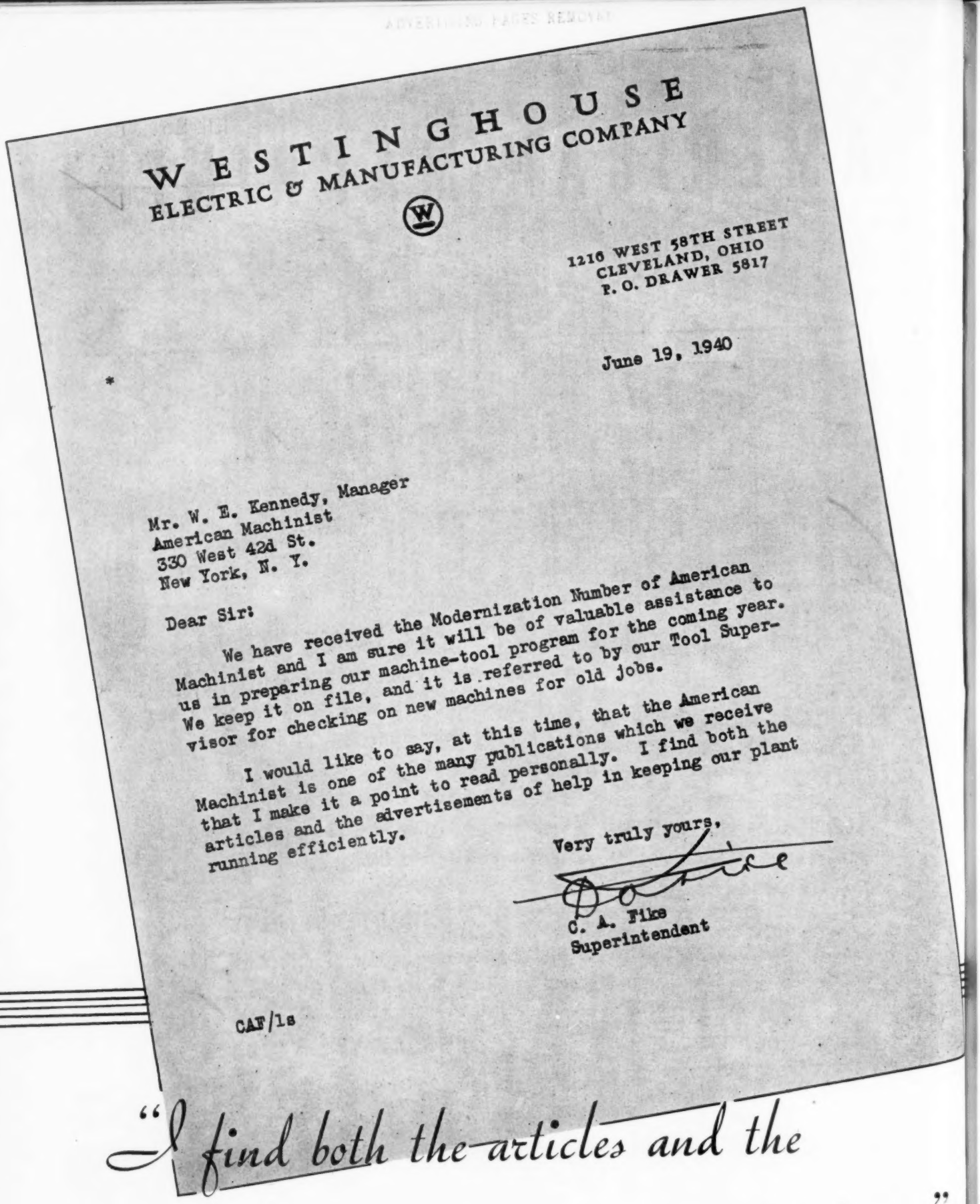

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June 19, 1940

Mr. W. E. Kennedy, Manager
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330 West 42d St.
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Dear Sir:

We have received the Modernization Number of American Machinist and I am sure it will be of valuable assistance to us in preparing our machine-tool program for the coming year. We keep it on file, and it is referred to by our Tool Supervisor for checking on new machines for old jobs.

I would like to say, at this time, that the American Machinist is one of the many publications which we receive that I make it a point to read personally. I find both the articles and the advertisements of help in keeping our plant running efficiently.

Very truly yours,

C. A. Fike
Superintendent

CAF/ls

"I find both the articles and the advertisements of help..."

WHAT'S IN THIS ISSUE

HOT TIME

Ever since we almost flunked our first course in metallurgy, heat-treating theory and practice have usually enveloped us in somewhat of a fog. Through the years, the mists have gradually cleared, but we are still doubly appreciative whenever someone comes at us with both barrels with language we really understand.

Such are our feelings for J. L. Burns and Victor Brown, of Republic Steel, for their excellent article beginning on page 523. It discusses the whys and wherefores of time quenching in language that makes the points

J. L. BURNS

clear to all. The simple time quench, the double quench and the interrupted quench are all taken up and discussed as to the procedure and its effect on the material. The authors don't maintain that the most complicated way is always the best; instead, they point out when which should be used where. Whether you've been having heat-treating troubles or not, we feel certain you'll find "The How and Why of Time Quenching" interesting reading.

SOARING STAINLESS

More sound and fury is being emitted by the lay press on the subject of aircraft production problems than on nearly any other. You've read about plastic planes which are ready to fly when the glue is dry, about 1,000-hp. engines stamped from sheet steel at virtually one crash of the press (actually!), about entire airplanes fused together in one glorious, blinding flash. You know the improbability of manufacturing developments proceding at such a miraculous pace. But you may wonder what actually has been done, to make the newspapers get so excited. So on page 527 we hereby bring the record up-to-date on the welding of stainless steel in aircraft structures.

LARGE SCALE

When most people see a picture of a man staring into a microscope, they conclude he's some scientific genius busy unlocking more secrets of the universe. A few years ago that was probably true; chances are today, though, that he's just measuring something. For as metal-working methods have advanced, the technique of measurement has been taxed to the utmost. Contour projectors are familiar to all; microscopes for inspection and even for setting production tools are finding ever-increasing use throughout industry. Like most new techniques, misunderstanding has preceded adoption in some cases. So the article on page 530 by Joseph Dauber, of Gaertner Scientific Corporation, should evoke considerably more than passing interest.

SPEAKING FROM EXPERIENCE

"I served a formal four-year apprenticeship in wood patternmaking. . . I like to get a rise out of machinists and toolmakers by reminding them that a lot of good men have come out of the patternmaker's trade," writes Walter F. Simon, who is now supervisor of apprenticeship for the Industrial Commission of Wisconsin. Mr. Simon speaks with benign tolerance because he has just got a load off his mind. That load is his opinion of manufacturers who "can't"—or won't—train apprentices. It offers such conclusive proof of the value (to the manufacturer) of apprentice training that we've printed it on page 537. There, under the heading of "No Apprentices?", you'll find some mighty good reasons why you, too, should take a couple of kids under your wing and show them what the score is. But to get back to Mr. Simon, who, by remote control, strikes us as being an interesting individual: "It is a curious fact that according to all available records I happen to be the first person to complete an apprenticeship under this state's original apprenticeship law. . . Exactly four years after graduation I found myself in charge of administering it. . ."

JOSEPH DAUBER

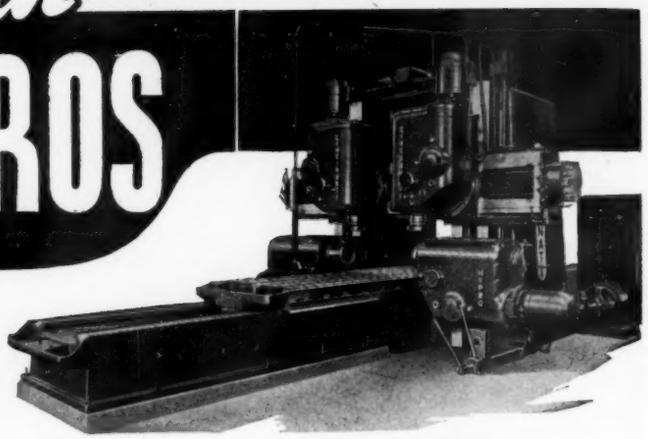
WALTER F. SIMON

COMING

When automobile men express approval of aircraft assembly methods, that's news. And that's the news we bring you in the story of Republic Aviation and how it gets the utmost out of jigs for mass production. It's in two parts, the first of which is scheduled to appear Aug. 7.

Also beginning in a forthcoming number will be a series of five articles on measurement for production. These articles start with the basic fundamentals and work up through the very latest principles and techniques of production measurement. It's by C. C. Street, of Federal Products Corporation, and will begin in an early issue of *American Machinist*.

MODERNIZE *with* HYPROS



OBSOLESCENCE is the simple process in a machine tool of becoming less and less productive . . . it can easily cost you the price of a new Hypro.

MODERNIZED Cincinnati Hypro Planers, Millers and Vertical Boring Mills are designed for modern production work of the most severe and exacting kind.—Speed, ease of operation, adaptability, and rigidity are some of the outstanding characteristics of these modern tools which assure large dividends to the cost-conscious production man.

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Massive pyramid shape Housings,—Table Drive delivers smooth flowing power free from side thrust pressures—completely self-contained Timkenized Milling Heads—these are but three of the numerous outstanding features offered in the new Cincinnati Hypro Planer Type Milling Machine.—Sizes up to 120".

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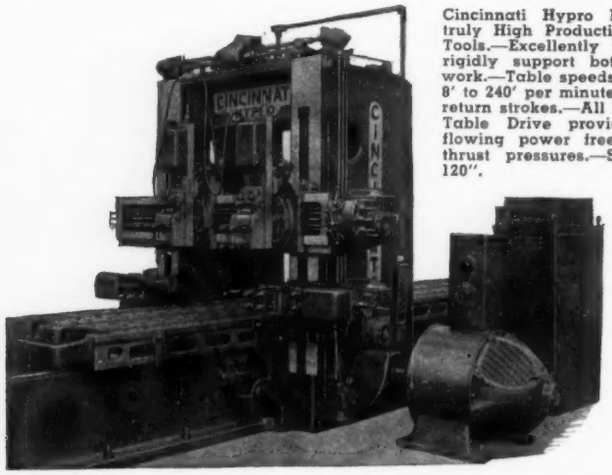

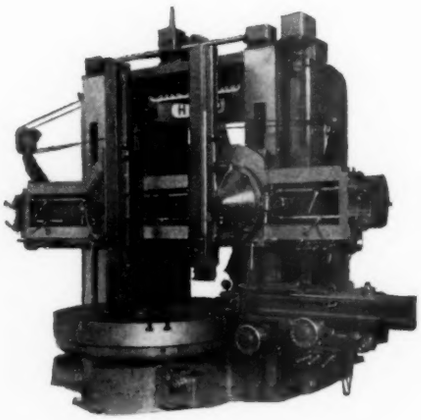

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Spiral bevel table gear—completely Timkenized speed box—anti-friction, roller bearing mounted rail head saddles,—these head a long list of substantial, High Production Features built into Hypro Mills.—Sizes 4', 5', 6', 7', 8', 10', & 12', also 10-16' Extension Mill.

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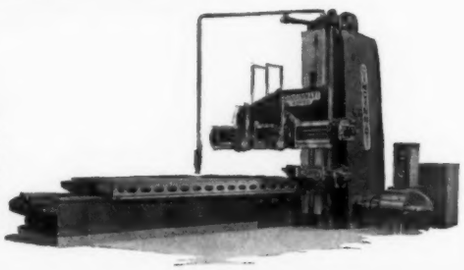
Cincinnati Hypro Planers in both Openside and Double Housing Machines offer trouble-free magnetic feeds to all heads. These feeds range in increments of 64ths, from $\frac{1}{64}$ to 1". Hypro Openside sizes up to 96".



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The Cincinnati Planer Co.

Cincinnati, Ohio

ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor

The how and why of time quenching

BY J. L. BURNS, AND VICTOR BROWN, REPUBLIC STEEL CORPORATION

When water quenching is too severe, and oil does not give sufficient hardness, a double or "interrupted" quench may produce the desired results

TIME QUENCHING probably started with the discovery that immersion in water caused cracks in certain critical parts which could be avoided by removing the pieces from the water after a short interval of immersion. Oil is used, of course, as a less drastic alternative to water, but there exists a gap between the two media which it has been found convenient to bridge by the use of so-called "time quenching."

The usual manner of treating steel parts is to heat them to a temperature somewhat above the critical point, where a crystallographic change from the alpha, or ferrite, phase to the austenite phase takes place, in which the carbides of the common steels are soluble.

When such a state has been produced, the parts are plunged into a media to prevent by rapid cooling the separation of the carbide into its stable soft pearlite. This quenching sets up stresses within the part which may literally tear the steel apart if of sufficient magnitude. This latter usually occurs where stress concentration develops—such as at sharp corners, edges, holes or tool marks. High hardness, high alloy content and drastic quenching all lend themselves to the production of these higher stresses.

It was found that by inducing a drastic quench during the early stages of the cooling, and then decreasing its severity toward its finish, that it was possible to reduce the stresses and any subsequent tendency to crack.

The word "time" denotes that exposure to a given quenching media is a measured one. The simplest time quench would be to expose an article to one liquid quenching medium for a predetermined period after which it would be returned to the atmosphere. Other forms of time quenching would be "double quenching," in which an article is exposed successively to two different liquid quenching media, at least one of which would be measured in the course of cooling to room temperature, and "interrupted quenching," in which the part is withdrawn from a single liquid medium and then replaced in the course of cooling to room temperature, the time of quenching before and during the interruption usually being measured. Other means of time quenching are possible; but the ones mentioned are the more important.

Specimens 1½ in. in diameter were simple time quenched, using various lengths of time in the quenching medium, which was water at 70 F. Hardness distribution curves were plotted in a common type U curve, showing the hardness distribution across the section of a bar (usually sectioned away from an end to measure accurately hardness differences from the surface through the center), and compared to full water and oil quenches. Fig. 1 is a 0.40 carbon steel, and Fig. 2 a 0.60 carbon steel. These steels offer difficulty when parts of a critical design require thorough quenching for the best physical properties. Even though the time allowed for quenching these parts was limited, the hardening response and the depth of hardening held up well. In Fig. 3, the cross-sections were etched to illustrate the extent of quenching. Concentric rings indicate the depth to which quenching took place. The difference in color of the rings between the various samples is caused by the difference in temperature at which the samples were withdrawn from the water. The

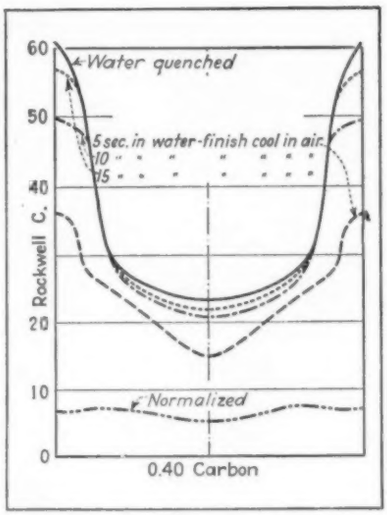


Fig. 1—A series of U curves taken across the section of a 0.40 C steel bar, 1½ in. in diameter, show the variation in hardness for different time intervals

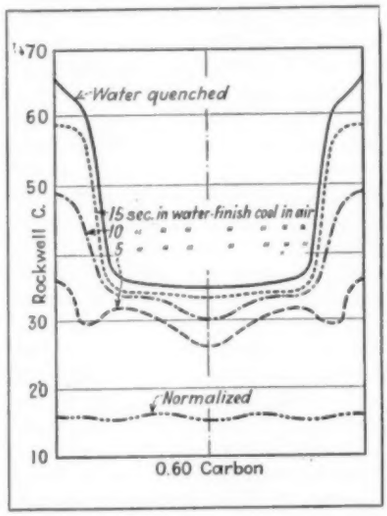


Fig. 2—A simple time quench on a 0.60 C steel bar gives the hardness distribution as compared to a full water quench

TABLE I

Sample No.	Quenching Conditions
1	Straight oil quench
2	2 sec. in water—transfer to oil
3	5 " " " " " "
4	8 " " " " " "
5	11 " " " " " "
6	14 " " " " " "
7	Straight water quench

TABLE II

Sample No.	Quenching Conditions
1	Water Quench
2	5 sec. initial quench, 1 sec. in air, back into water
3	5 sec. initial quench, 3 sec. in air, back into water
4	5 sec. intital quench, 5 sec. in air, back into water
5	Oil quench

TABLE III

Cross section	Time
¾–1½"	1 to 15 sec.
1½–2¼"	5 to 25 sec.
2¼–3"	10 to 45 sec.

photomicrographs of a typical simple time quenched sample show the quality of structure through the section.

This method of time quenching is probably the most common deviation from the full quench. Many tool treaters find that it may be successfully used on water-quenching tool steels where parts of critical design would otherwise spall or crack if allowed to remain too long in the bath. Rivet sets, small dies, cutters and pins are handled by timing the quench, which may vary from a few seconds to nearly a minute.

Industrial parts made of water-quenching steels, SAE 1035, 1040, 1050 and 5130, are likewise subjected to such treatment. A machined part made of SAE 5130, for instance, was given a 12-sec. water quench. Maximum physical properties were obtained with (1) a minimum amount of distortion and (2) the least possible danger of cracking.

Some manufacturers modify time quenching by using a water spray either at local points or over the whole part for a given time. Such an arrangement may be automatic and provide a high degree of reproducibility. Tons of steel have been handled by conveyor to give continuous flow of production; this is largely responsible for giving simple time quenching a place in present-day mass production.

Use of a water spray to direct quenching medium to localities where hardening is desired has made this method in many instances a time quench. Reasons: (1) the time factor for handling, (2) the desire to allow hot portions to draw quenched areas and thus release stress, and (3) lower heat-treating costs.

Large conveyor or track links usually need be hard only at points which rub against guides or furnish tracks for rollers. The rest of the part has adequate strength as normalized; therefore, no attempt is made to give any but wear surfaces a drastic quench.

Such a part is heated in a furnace to the usual temperature for the regular length of time. Instead of submerging the entire piece as usual, it is placed in a jig and a jet of water directed at portions desired hardened. A timer on the water valve automatically controls the length of quenching; the wearing surface receives a full quench, whereas the remainder gets only a short time quench extracting sufficient heat to prevent excessive softening. After the water flow is stopped, the piece is removed and later drawn.

This method is typical for handling parts where differential hardness is required. It may be desirable to do some sizing or machining after heat-treating; in such cases these portions may be left soft. Hardness may be varied to a large degree by varying the timing of the jet, or even by varying the degree of draw after quenching.

There has been increased activity in recent years with methods to harden steel pieces locally. Flame and electrical induction hardening have been widely used, and will answer many purposes where time quenching with a water jet or spray would formerly have furnished the best answer. Where an article would have been heated in its entirety and quenched locally by using flame or induction methods, the part may be treated only locally and quenched either wholly or partially. Local heating has certain advantages. Its speed, simplicity of handling, and minimum of scaling and distortion are difficult to duplicate in other methods. In considering methods to be adopted, cost, available equipment, number of parts, and the grade of steel to be treated are all factors which will influence the choice.

Samples 1½ in. in diameter were heated at 1,500 F. for 45 min., then immersed, one at a time, for a given period in water, followed by quick transfer to an adjoining oil tank. The transfer took approximately 1 sec. These tests were made under close control for accuracy; timing used is shown in Table I.

Curves are shown in Figs. 4 and 5, and photographs of etched cross-sections and microstructures in Fig. 6. A peculiar dip may be noticed in some of the curves. This is caused by drawing the outside ring by heat flowing out from the center. The outside surface is thus stress-relieved by tempering and aids in preventing cracks.

While it is difficult to conceive

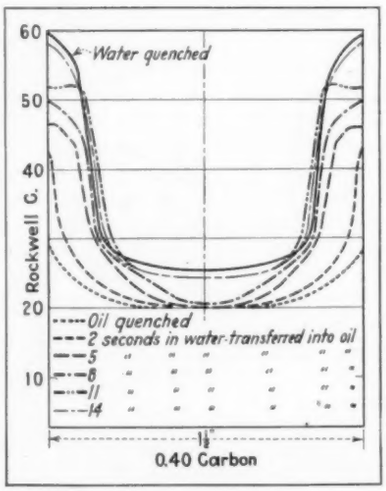


Fig. 4—Hardness distribution is shown for a 0.40 C steel full water quenched, and water quenched, then transferred to oil

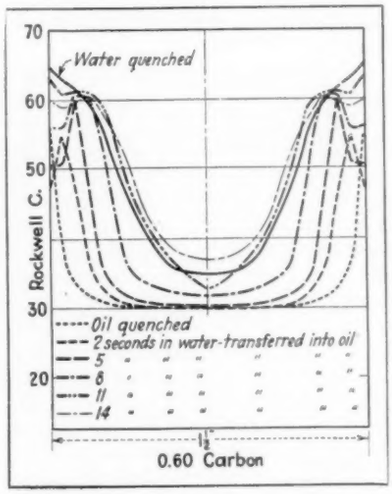


Fig 5—Effect of double quenching is also shown by the hardness distribution curves for a 0.60 C steel for different quenches

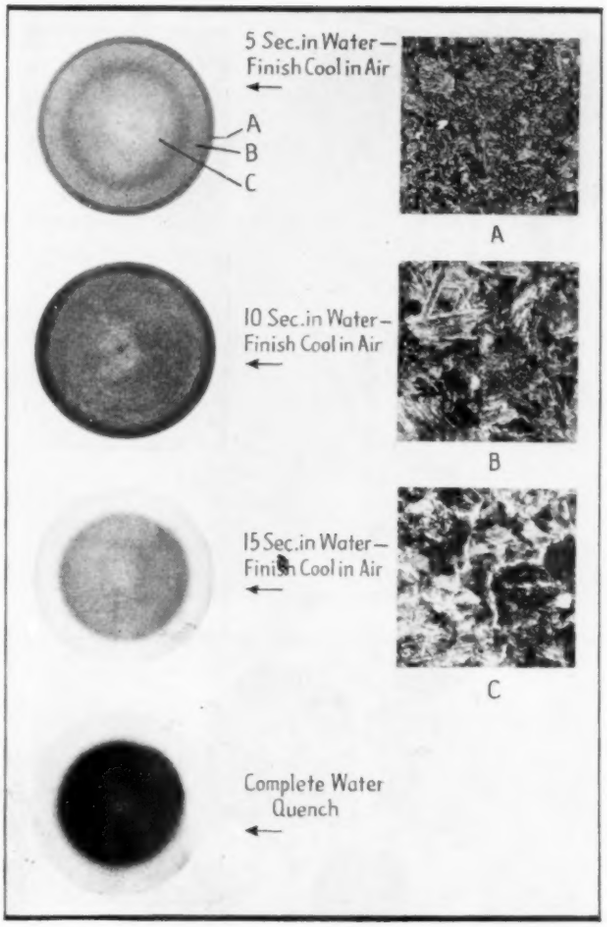


Fig. 3—Macrographs of etched cross-sections of a 0.60 C steel bar show the varying depths of hardening effect for different quenching conditions

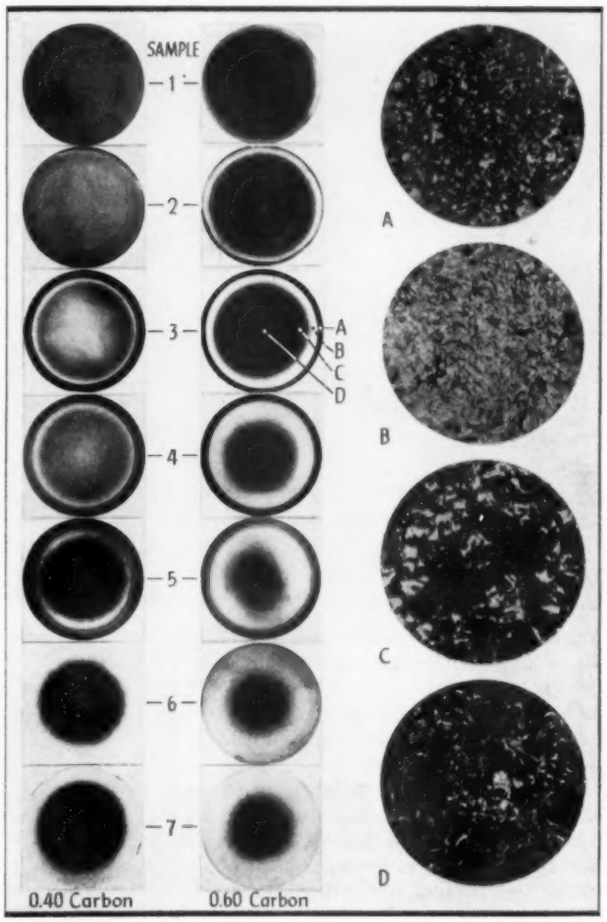


Fig. 6—Macrographed cross-sections of 0.40 and 0.60 C steel show hardness penetration; microphotographs give the grain structure of a typical piece

where a part with a softer surface than sub-surface area would be wanted, if the need arose here would be a unique way of obtaining it. Fig. 7 shows curves after varying tempering temperatures, and shows how this hardness gradient may be leveled. Photographs, Fig. 8, represent a sample of 0.60 carbon steel after it has been tempered. Note the uniformly fine structures obtained through the different rings.

The main advantage in this method over the simple time quench is on fairly massive parts where the retained center heat might exert too great a tempering action if the part were allowed to finish cooling in air. The transfer to a milder oil quench, after obtaining the benefit of deep hardness penetration in water, permits sufficient additional heat to transfer from the steel to prevent tempering without exposing the part to the high stresses which would occur if the part remained in water until fully quenched. The short interval in air during the transfer produces some drawing as may be seen in the curves and photographs; this also helps to curb severe quenching stresses. Certain dies and rather large mill shear knives, handled in this manner, show less tendency to crack and perform well in service. Large bull gears made of SAE 1045 steel have been quenched by this method (50 sec. water dip) to hold down cracking and also distortion.

When a steel is heated, immersed in water, withdrawn for a relatively short time in the course of cooling and then plunged back into water, it is called "interrupted quenching."

A group of samples was treated in this fashion to study the effects. Time may be varied during any stage of the procedure. In this instance the period in air was varied. From previous experience with double quenching it was known that 5 sec. in water produces a sharp, dark, outer ring, this period became constant. The final dip lasted until the sample became completely cold. The timing used is shown in Table II.

Curves of the two grades of steel and the photograph of etched cross sections shown a striking similarity to those obtained with double quenching.

This method is not generally used, but it may have certain advantages as an alternative to double quenching, since it does not involve the use of oil. Contamination of oil with water would be objectionable—because it would unfit the bath for strictly oil-hardening steel of high hardenability. Cracking would be likely to occur. Then again, some shops may not have oil and water facilities located near enough together to permit double quenching satisfactorily; here particularly interrupted quenching might be used to advantage.

Generally speaking, the most economical method of heat-treating is the simplest method, and time quenching with its many factors cannot be called simple, unless used with well arranged and automatic equipment. Steels are made today which answer practically all needs using conventional heat-treating methods. On the other hand, there are some cases where special methods appear to be in order. When they occur, we often find ourselves lacking sufficient experience or having

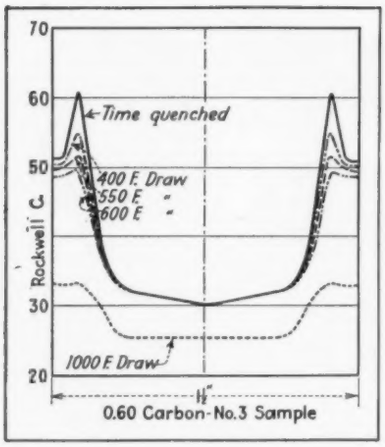


Fig. 7—Heat flowing from the center of the bar may make the outside surface softer than the sub-surface area. Tempering will level this hardness gradient

certain prejudices because of a lack of knowledge of the "unusual" methods which are available. Time quenching often falls in this category, but with proper application has been found to serve a useful purpose.

Proper timing may offer the greatest problem in the treatment of a part. One manufacturer has solved the matter satisfactorily with track shoes by water quenching until the cooling vibrations cease. These parts are immersed with a pair of tongs until the operator no longer feels the vibrations, then withdrawn from the quenching bath and placed on a conveyor running through the draw furnace. Previously, these parts were a constant source of trouble, as they exhibited a consistent tendency to crack. After changing the method, cracking became a rarity.

In deciding on the timing of a given part, the various properties must be considered as well as the reasons for going to a time quench. If the Brinell hardness of the finished part is such that a high draw temperature is necessary, then the heat-treater has a comparatively wide range of time in which to work. The same holds true if the piece is massive. On the other hand, if the piece is small, or where higher physical properties are required, it is necessary to control the timing closely. This is said with the understanding that the work is to be drawn. Even though some drawing is accomplished by the heat left in the steel, it is recommended that any stressed part be given a draw to insure the benefit such treatment imparts.

It is difficult to establish a hard and fast rule for the timing. However, a rough estimate, as a starting point for a new job, is suggested in Table III.

The shorter time in each bracket should be used for the correspondingly smaller sizes, for high hardenability steels or for lower hardness. For instance, on an approximate cross-section of ¾ in. on an 0.40 plain carbon steel, the timing for 55 Rockwell C hardness at the surface would be 3 sec. (double quenched) while a 1½-in. cross-section of the same grade would require 11 sec. to obtain a similar degree of hardness.

If a 0.60 carbon steel were used we would find it impractical to time quench a ¾-in. piece, since it would handle well in oil, and the 1½-in. piece would require only 5 sec. to obtain the same surface hardness of 55 Rockwell C.

Judgment in timing is soon gained by a good heat-treater; where a number of parts are to be run, timing may be adjusted if the first pieces show a deviation from the desired hardness.

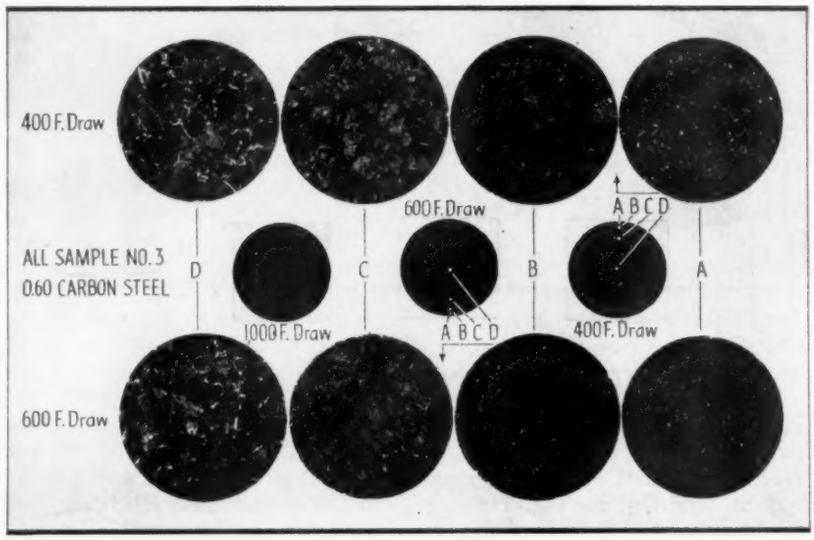


Fig. 8—Tempering may be used to give uniformed fine structure through the different rings as in these 0.60 C steel samples

Shell Peeves

DEAR SIR:

I was unfortunate enough to learn what I know about the machinist's trade by actually working at it.

That seems a ridiculous way to do it today when they learn it in a CCC camp by planting trees and building roads and reading books on shop management in a college course and listening to lectures by someone who got his the same way.

My present "pet peeve" is the very foolish practice, being attempted on all sides, of not machining the inside of shell but "finish forging" them. Everyone falls for it and if they ever try it in *mass* production the "hospital" will be the largest department in a shell shop. Frankford makes 525 5-in. Navy shells per shift that way and tell you they are "as forged" inside, but if you tip them up and look into the end you'll see a scraping cut in the bottom scale was taken when they faced the open end on their four-station horizontal Baker machine.

They may get by with this on shell up to 6-in., but never as satisfactorily as if they are machined.

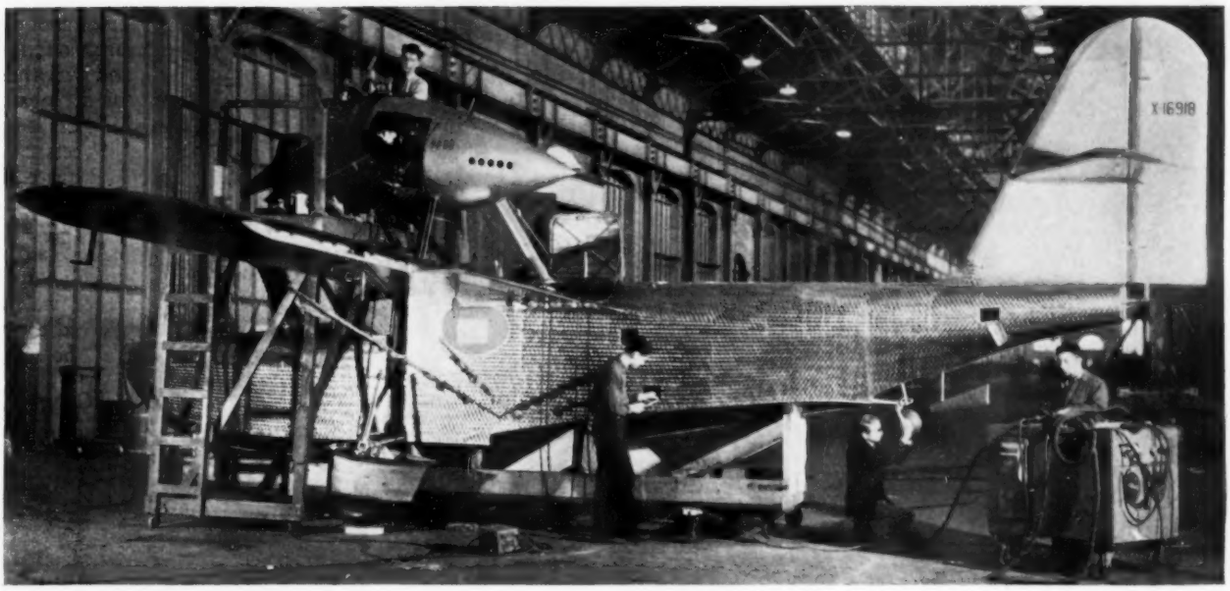
Another thing that "gets me down" is the tendency to use high speeds and microscopic feeds. The crowning insult to intelligence is when you are shown a slick and slippery finish turned shell that looks as if it had been nickel plated and your attention is called to its beautiful appearance.

That appearance comes from a feed of about 0.006 in. with carbide tools.

The best feed for shell finishing was pretty well determined at around 0.070 in., and there was a reason. The feed should be coarse enough to hold paint or grease well and, *above all else,* to provide a secure hand hold for the man in the field.

These slick surfaces on shell as large as 6 in., that weigh 100 lbs. or so, are positively dangerous for artillerymen to handle at speed.

LUCIEN I. YOEMANS,
Lucien I. Yoemans, Inc.

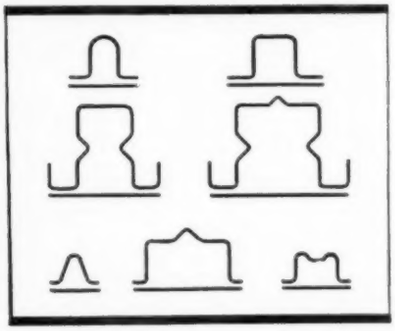


The Fleetwings Sea Bird is constructed almost entirely of stainless steel. High electrical resistance and low heat conductivity of the material make possible rapid and economical fabrication by spotwelding

Stainless steel in aircraft

BY CARL DE GANAHL, VICE-PRESIDENT, FLEETWINGS, INCORPORATED

Wings, control surfaces, fuel tanks and complete planes of stainless steel are fabricated rapidly and economically by spotwelding. Thin-gage stock is used for structural parts



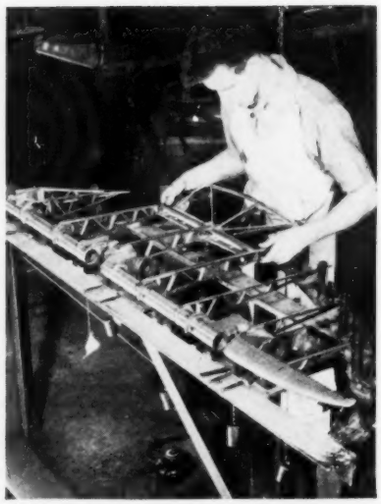
Stringers and stiffeners for Fleetwings aircraft structures are made from flat thin-gage stainless steel. The flat material is rolled to form channel sections with narrow flanges for welding to flats, producing closed box beams, I-beams and other shapes. The small diameter of the spotweld makes possible the use of narrow flanges without sacrificing strength

WHEN STAINLESS STEEL was first offered in thin gage strips with tensile strengths approaching 200,000 lb. per sq. in., with excellent elongation and other physical properties, Fleetwings, Inc., developed spotwelded steel structures suitable for aircraft. The thin gages required for lightweight construction necessitated the design and development of special forms and shapes of these structures to sustain compression and torsion.

Special tools had to be devised and made for manipulating the metal. When this had been accomplished, and extensive fabrication of plane structures was undertaken, it was found that production could proceed on an economic basis. Plane wings, control surfaces, fuel tanks and complete amphibian aircraft of stainless steel are now in successful production. Among recent products built by Fleetwings are control surfaces for Republic P-35 pursuit planes and Stinson aircraft, as well as wings and wing-tip floats for Douglas Dolphin amphibians. Also, the Fleetwings Sea Bird for the commercial market has a basic structure of stainless steel.

Stainless steel used in the manufac-

Sub-assemblies of stainless steel control surfaces are spotwelded in individual jigs. Leads for the spotwelding tools are clamped to two heavy bus bars running down the center of each work bench. The bus bars are connected to a single spotwelding machine, regardless of the number of spotwelding tools used at the bench



Final assembly of control surfaces is accomplished with the aid of jigs. Portable spotwelders controlled by foot-pedal switches speed the work. The built-up sections rolled from flat stainless are used in making the sub-assemblies of hinge brackets and stiffeners for the control surfaces, which are finally covered with fabric

ture of these aircraft and component parts is obtained in strip form 24 in. wide and thicknesses from 0.006 in. to 0.095 in. and more. In these thicknesses it can be obtained with a minimum tensile strength as high as 184,000 lb. per sq. in., a yield point of 150,000 lb. per sq. in., and elongation between 12 and 20 per cent. It is tough, will stand considerable abuse in forming and twisting, and has high fatigue values. It is austenitic with a characteristically high electrical resistance and low heat conductivity; these prove advantageous for rapid and economical fabrication by the spotwelding process and make possible spotwelded joints of high strength.

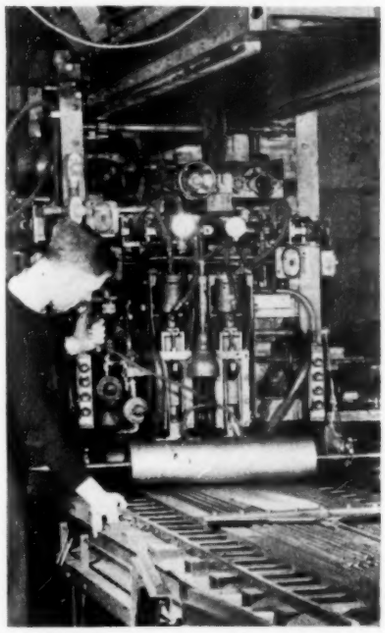
Stringers From Flat Stock

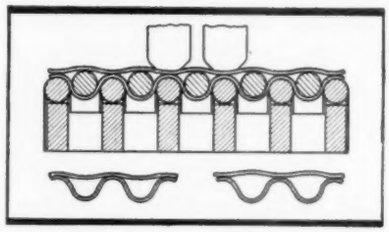
Since the thin gages of stainless used have little lateral stiffness, the sheets are rolled or corrugated to form channel sections with flanges, which are then welded to flats to produce closed box beams, hollow-web I-beams and other shaped stringers and stiffeners. These structural shapes are strong in both compression and torsion. The small diameter of the spotweld permits the use of narrow flanges, allowing minimum weight. A flange $\frac{3}{16}$ in. wide suffices for welding typical stringers, but $\frac{1}{8}$-in. flanges on some members have proved adequate for constructional purposes. Typical stringers and stiffeners are made with forming rolls from flat stock in the shapes illustrated in one of the drawings.

These built-up sections are used in the fabrication of wing ribs and stiffeners, fuselage sections and ribs, nose sections and hinge brackets for movable control surfaces. All sub-assemblies for the latter are built in individual steel shapes. The hinge brackets and nose assemblies are mounted in small steel jigs on a work bench along the center of which run two heavy copper bus bars which are connected by two heavy secondary leads to a portable welder controlled by a foot pedal switch. Portable spotwelding tools are connected to the bus bars; the tools are of various shapes, depending on the nature of the job and the position of the spotweld required. Thus, only one welding machine is required for each workbench, regardless of the number of individual spotwelding tools required at the bench. Sub-assemblies made at these benches are mounted in final assembly jigs and when properly held in place are welded together with a portable spotwelder. Final assembly of these movable control surfaces is shown in the illustrations; the assemblies are later covered with fabric.

The technique followed in making large wing panels is typical of the engineering and fabrication methods used for all structures. The wings are a D-section monospar type in which a single shear web of corrugated stainless steel with a vertical stiffener is provided at about 30 per cent of the chord. The nose ribs are bolted in place to the shear web, and over them is stretched a covering of corrugated sheets which vary in thickness from the root to the wing tip. Sheets 2 x 5 ft. and 0.01 in. thick are corrugated in a press, their ends overlapping so that the corrugations mate; these are then welded together, forming a single sheet for the nose covering. It is stretched over the nose ribs, welded directly to the ribs, and bolted to the shear web. This completes the structure of the wing nose.

Cantilever ribs are bolted to the back of the shear web and covered





The skin is formed by welding flat sheets to corrugated stock in this machine at a maximum rate of 960 spots per minute. Oversize rods are placed in the corrugations to produce the result shown at the lower right of the drawing. When the skin is bent around the leading edge of a wing, it stretches, reducing the high spots and making a perfectly smooth surface. The welded skin at the lower left in the drawing was obtained before oversize rods were used in welding the corrugated sheets to flat stock

with fabric from the shear web aft. This completes the wing structure. Some of the wing panels are 30 ft. long, have a root chord of 16 ft., a maximum thickness at the root of 18 per cent of the chord and 9 per cent at the tip, an under-surface area of 350 sq. ft., and weighs 762 lb. Full advantage of the strength-weight ratio of stainless can best be obtained in such large structures, since thick-gage strip can be used.

A feature of the wing construction is that fuel tanks form part of the lower skin, and are built to carry the necessary stresses. Corrugations in the side metal prevent bulging. Joints are made liquid tight either by seam welding or spotwelding for strength, and filling in the joints with solder.

A large amount of local stiffness in the skin is desirable in the leading edges of wings, in split flaps and in fuel tanks where pressure is heavy. In order to obtain the required stiffness, stainless steel sheets 0.005 in. thick are formed into corrugations $\frac{3}{16}$ in. deep and having a $\frac{5}{8}$-in. pitch. These corrugations are then spotwelded to a flat sheet of the same thickness, making a skin $\frac{1}{4}$ in. thick; this is the skin which is stretched around the nose ribs of the wing as previously described.

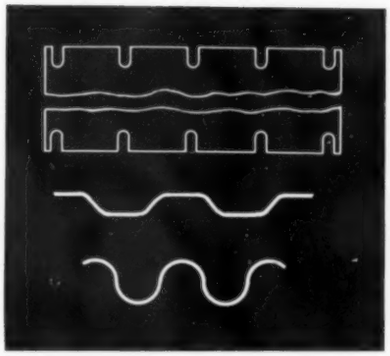
Making the Corrugations

There are two major problems in this type of skin construction: first, the making of corrugations with satisfactory compression strength, and second, preventing the formation of flats in the skin between the corrugations when it is bent around the nose ribs to form the leading edge.

The first problem was solved by forming semi-circles of the corrugations with a depth equal to half the pitch, each corrugation being tangential to the adjacent one. High compression values can be obtained with this design when compared with the sine-curve type of corrugations usually made in light alloy metals. The semi-circular corrugations must be uniform in each sheet in order to have them fit together accurately when overlapped and make strong joints. This is accomplished by notching the ends of the flat sheets at accurately spaced intervals, and registering these notches in locating pins in the corrugating press. Hence, when the sheets are pressed they do not slip and uniform corrugations are assured. One die in the press first forms the parts of the corrugations where the semi-circles are to tangent to each other; then a second die forms the corrugations to the required radius. The form of the sheet at the end of each of these operations is shown in one of the drawings. This method holds the variation in corrugations within 0.005 in. in 24 in. of developed material.

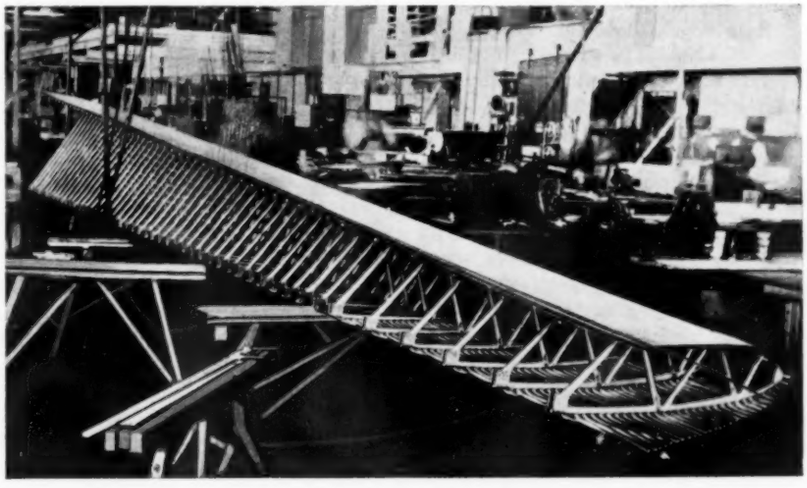
Prevention of Flat Spots

The second problem in skin construction—the prevention of flats between crests of the corrugations when the skin is bent around the nose ribs—is overcome by laying over-sized rods in the corrugations before placing the flat sheets on top and welding them to the crest of the corrugations. This method of preparing the corrugated and flat sheets for welding is illustrated. It results in sufficient excess metal between the crests to produce a wavy appearance when the skin is flat; when it is stretched around the nose ribs of the wing, these waves become smooth and follow the contour of the nose.



Corrugations in Fleetwings skin construction are semi-circular. They are formed by notching flat stainless sheets at accurately spaced intervals and fitting the notches into locating pins in the corrugating press. This prevents the sheets from slipping under pressure and assures uniform corrugations. Because the latter are semi-circular, rather than of the usual sine-curve type, the sheets are pressed in two steps; the lower two views show the two stages of forming the semi-circular corrugations

To expedite the welding of the flat nose surface to the corrugations, Fleetwings uses an automatic spot-welder capable of making as high as 960 spot welds per minute. A copper grid connecting all parts of the machine electrically is mounted on a table which rolls on tracks. The corrugated sheet is placed on the copper grid with the corrugations at right angles to the table movement. Oversized rods, mentioned previously, are placed in the corrugations, and a flat sheet of stainless steel is stretched over it; the ends of the flat sheet are held by jacks which stretches the sheet until all sags and wrinkles are removed. A heavy pair of rollers, one immediately aft of the electrodes and one immediately forward, act as rolling clamps to hold the flat sheet firmly against the corrugations and prevent twisting while the sheet is being welded to the corrugations. A roller welding machine slung on an overhead track parallel with the corrugations is moved by rack and pinion at variable speeds. When the welder electrodes are lowered into contact with the flat sheet, welding starts. The variable-speed drive gives three welding ranges of 240, 480 and 960 spots per minute.



The leading edge of a 30-ft. wing panel is made of spotwelded ribs, stiffeners and corrugated skin, all of which have high compression and torsional strength. The assembly is bolted to a shear web. Cantilever ribs, running aft from the shear web, are bolted in place and covered with fabric to complete the wing

The microscope as a shop tool

BY JOSEPH DAUBER, GAERTNER SCIENTIFIC CORPORATION

Continual narrowing of production tolerances in the metal working industry has brought with it a need for very precise measurements. Microscopes often fill the bill in this respect

THERE ARE TWO MAJOR CLASSES of measuring microscopes. First, there are microscopes, which form a part of a larger apparatus, used for the purpose of making settings to greater accuracy than otherwise would be possible. Although the microscope in this case may seem a mere accessory, it is an essential part of the instrument. It would be impossible to use the full precision of the measuring element without the microscope, and many objects cannot be measured by any method which involves contact.

The second class of measuring microscope involves measurement within the microscope itself. These may be termed micrometer microscopes. They are frequently used in conjunction with other measuring equipment, particularly scales.

The major classes of industrial microscopes can be subdivided as follows: When the microscope is used for setting only, with external measurement, there are two types: (1) moving microscope with stationary stage, and (2) stationary microscope with moving stage. When measurements are made inside the microscope, it may be one of two classes: (1) a scale micrometer microscope with the object measured by a scale, and (2) a filar micrometer microscope with the object measured by a micrometer screw.

The advantages of using measuring microscopes are obvious. The instrument does not touch or affect the object being measured, unless the object is sensitive to the light of the spectral region being used. The object or phenomenon can be viewed and measured simultaneously. No ground glass or screen is required; vision is clear. Only a comparatively low illumination is required, making for small and cool light sources. Measuring microscopes are easily set up. They are largely self-contained and, except for the largest types, are quite portable.

Among the disadvantages of measuring microscopes are the following: (1) the instrument can be used by only one observer at a time, and (2) for measurements of high precision, magnification must be increased. This increase of magnification narrows down the field of view on the object and decreases the working distance between the objective and the object.

A blanket statement as to the limiting precision of measurement cannot be made to cover all cases. The choice of proper optical constants depends on shape, size, transparency, and accessibility of the object being measured. Generally, the limits may be stated as follows: Under ordinary conditions measurements can be made readily to a fraction of a ten-thousandth of an inch, and under the most favorable conditions and line settings, to a fraction of a hundred-thousandth of an inch. As compared with unaided visual line setting, the accuracy of setting with a measuring microscope roughly can be taken as proportional to the magnifying power. A measuring microscope with 60 deg. crosslines and a total magnification of 30X to 35X can be depended on to repeat line settings within 0.00005 in.

The following formulae, although only approximately true, will be of assistance in selecting microscopes. Those marked with an asterisk do not apply to compound microscope objectives, usually of 16mm focal length or shorter, for which tables supplied by the manufacturers should be consulted. Most microscope objectives used in measurements are achromatic doublets, and for these the formulae will hold within a few millimeters.

If W is taken as the working distance (distance from object to lens) and T is the optical tube length (distance from lens to reticle), and Fo is the focal length of the objective, then:

$$\frac{1}{W} + \frac{1}{T} = \frac{1}{Fo} \text{ (*)}$$

If Mo is the magnifying power of the objective, then:

$$Mo = \frac{T}{W} \text{(*), and } T = Fo(Mo + 1)$$

For total magnification,

$$Mt = Mo \times Me$$

where Mt is the total magnifying power of the entire microscope and Me is the magnifying power of the eyepiece. A Ramsden type eyepiece is assumed throughout this article, since this eyepiece is most suited for measuring applications.

For a telescope, the last equation given above should be restated as:

$$Mt = \frac{T^2}{Fo \times Fe}$$

where Fe is the focal length of the eyepiece.

For field diameter,

$$Do = \frac{Dd}{Mo}$$

where Do is the diameter of the field on the object and Dd is the diameter of the reticle diaphragm.

A typical scale micrometer microscope is shown in Fig. 1. When using this microscope a suitable graduated scale (reticle), placed in the focal plane of the eyepiece, appears superimposed on the magnified image of the object being measured. The constants of the system preferably are so adjusted that a direct reading is obtained. If S is the actual spacing of the lines on the reticle, Mo the magnifying power of the objective lens with the tube length used and d is the value of each division of the reticle scale in the reading, then

$$d = \frac{S}{Mo}$$

It generally is inadvisable for the user to do any machining on the microscope tube in order to change the magnification by changing the tube length. This is better effected by interchanging objectives, of which there is a sufficient variety available to cover most useful ranges of measurement.

It would seem advantageous to use the highest possible magnification, thus obtaining highly precise readings with comparatively coarse scales. However, it should be borne in mind

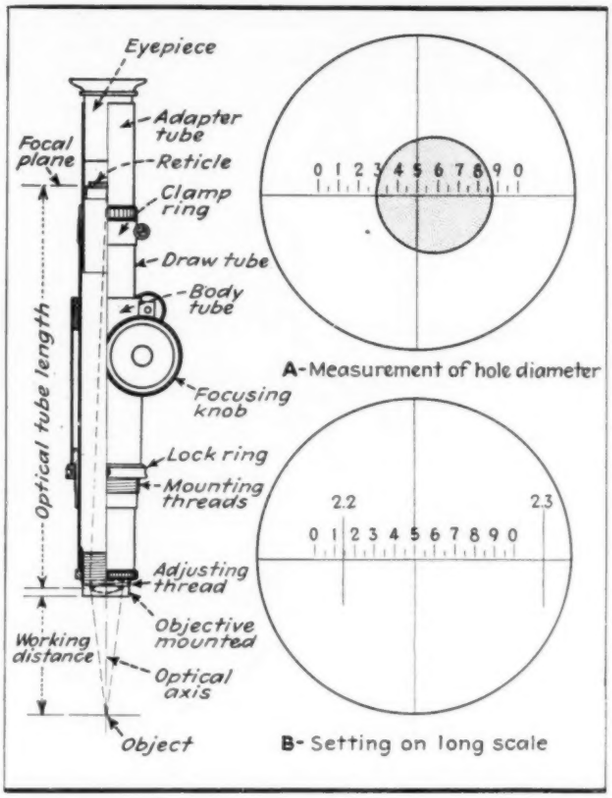
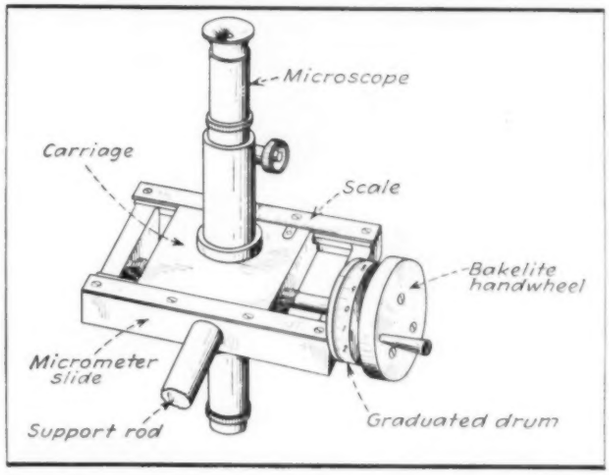


Fig. 1—In the scale micrometer microscope, a graduated scale reticle in the focal plane of the eyepiece appears superimposed on the magnified image of the object. A direct reading may be obtained when the constants of the system are properly adjusted

Fig. 2—Moving microscope-fixed stage instruments incorporate a means for supporting and moving the microscope while measuring precisely the linear distance it is moved. Micrometer slides for such setups have been made with as much as 8 in. movement



that increasing the magnification shortens the working distance, reduces the field of view, increases the illumination necessary, increases the cost of the objective, and makes the equipment more sensitive to disturbances. The lowest possible magnification should be almost always used, and it sometimes is even preferable to obtain the last desired figure of a reading by interpolation.

At *A* in Fig. 1 is shown the field of view of a scale micrometer microscope when measuring the diameter of a hole. In this case each division of the scale is equal to 0.001 in. on the object, and the range of measurement is 0.1 in. Therefore, the diameter of the hole is 0.0576 in. At *B* in this same illustration is shown the field of a scale micrometer microscope when used for setting on a longer external scale. A long scale, suitably engraved, can be attached to the moving portion of a machine tool and the scale micrometer microscope mounted in a fixed position on the machine. The position of the movable part then can be read by means of the microscope. In the setting shown at *B*, the setting on the long external scale is 2.2145 in.

When measurements are to be made by moving the microscope, a fixed stage instrument is used. As shown in Fig. 2, such a set-up consists of a microscope and a micrometer slide, which is the measuring element. This is one of the most versatile and least expensive of high precision measuring instruments. It can be used both for vertical and horizontal measurements. Usual ranges are 1, 2 and 4 in.; semi-special micrometer slides can be had in 6 and 8 in. ranges. Ordinary models read 0.0005 in. per division of micrometer drum, and are accurate to about 1/5 division. High precision models read to 0.00005 in. with a vernier.

The carriage of the micrometer slide, which is provided with a threaded hole for the microscope body tube, is moved on straight parallel ways by a nut which traverses the micrometer screw. A bakelite handwheel provides a good grip for delicate setting and prevents the body heat of the operator from reaching the screw.

The entire range of measurement on the object must be illuminated, or the microscope itself must carry an illuminator. The comparatively long distance between the object and the ways requires that the latter be accurately straight, since any tilt will result in rather a large error. Several types of moving microscope-fixed stage instruments are available. These differ principally in the method of supporting the micrometer slide for convenience in making certain types of measurements.

The cathetometer is a special type of moving microscope for covering large ranges, usually in a vertical direction, and usually without a measuring screw. A scale is used as the measuring element. When used for distant or otherwise inaccessible objects, it is provided with a telescope rather than a microscope. A crosshair in the telescope is set on the object by the observer, the height of the telescope being read from the scale on the vertical guide column by means of a vernier on the slide. Readings to 0.05mm (0.002 in.) are common; replacement of the vernier by a micrometer microscope gives closer readings. The head of a measuring cathetometer is shown in Fig. 3.

Because of the large separation between the cathetometer and object, very slight irregularities in the ways can cause considerable errors. Therefore, a sensitive striding level is placed on the telescope to detect tilt, and a delicate adjustment is provided to compensate for it. The guide column in better instruments is rotatable on its vertical axis, so that for the most exact measurements a scale can be placed at the same distance from the telescope as the object, and as near to the latter as possible, measurements being made by swinging from one to the other.

A good example of the fixed microscope-moving stage type instru-

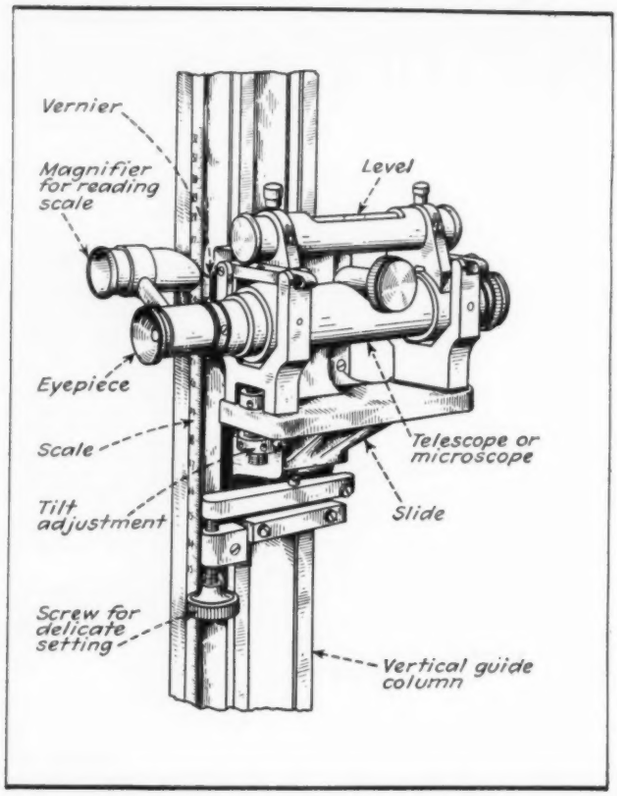


Fig. 3—Cathetometers are used for accurate measurement of vertical distances. Telescopes frequently replace microscopes in these instruments, particularly when used for distant objects

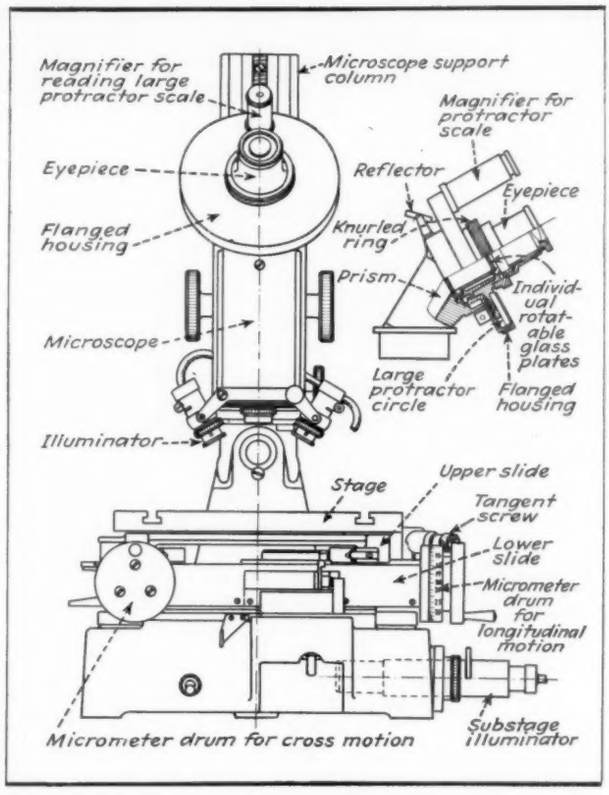


Fig. 4—Coordinates can be measured with accuracy on the toolmaker's microscope. This fixed microscope-moving stage type instrument is one of the most effective applications of optics to shop use

ment is the toolmaker's microscope. This is one of the most elaborate and effective applications of optical methods to technical measurements. Length can be measured in two directions in the horizontal plane and angle in any direction. This enables complete measurements to be made on jigs, tools, screws, hobs, tapers and many other parts difficult, and sometimes impossible, to gage by other methods.

As shown in Fig. 4, when making linear measurements the microscope is set in position and the object moved beneath it on the stage. The stage moves on compact slides which travel on precision ball bearings preloaded in hardened and lapped steel guides. The lower slide moves longitudinally on the base while the upper slide provides the cross motion for coordinate measurements. Each slide is operated by a micrometer screw, the floating nut having a hardened steel insert maintained in contact with its respective slide by spring tension.

The full range of stage travel for a typical toolmaker's microscope is 4 in. of longitudinal motion and 2 in. of cross motion. The micrometer drums are graduated to read 0.0001 in. per division. The stage can be rotated 5 deg. by means of a tangent screw. A micrometer tangent screw showing the stage rotation in tenths of a degree can be supplied with most of these instruments.

To facilitate point-to-point setting on angular objects, such as screw thread profiles, as well as for making angular measurements, the reticle of the toolmaker's microscope consists of two thin glass plates, individually rotatable, the engraved sides of which face each other with very little separation. One plate carries the zero line and a short protractor scale, and is rotated by a knurled ring around the eyepiece. The other plate carries a single line and turns with the large protractor circle which is fully inclosed in the large flanged housing around the eyepiece.

The microscope shown has a total magnification of 30X. The eyepiece is inclined at a convenient angle by a prism which also produces an erect image with natural direction of motion. The microscope support column can be tilted for accurate setting on the contours of screw threads.

Types of reticles for moving microscopes or moving stage measuring instruments are shown in Fig. 5. The most versatile of fixed crossline reticles is that shown at *A*. This 60 deg. reticle may have either spider thread or lines engraved on a glass plate at 60 deg. to each other. Settings are made on wide lines by balancing visually the small triangular portions of the line which appear right and left of the crossline junction. If the line, as it appears in the field of view, is no wider than the crosslines, setting is made by using the line to bisect the clear spaces above and below the junction of the crosslines. On well defined lines, using a minimum of 30X or 35X magnification, it will not be found difficult to repeat settings within 0.00005 in.

For special applications, the parallel crossline reticle shown at *B* is capable of more exact setting than the 60 deg. crosslines reticle, but when the highest precision is required, the spacing of the crosslines should be correlated with the width of the gage line and the magnification.

The 90 deg. crosslines reticle, shown at *C*, is not as useful as the two types just described. In some cases, the horizontal line assists in

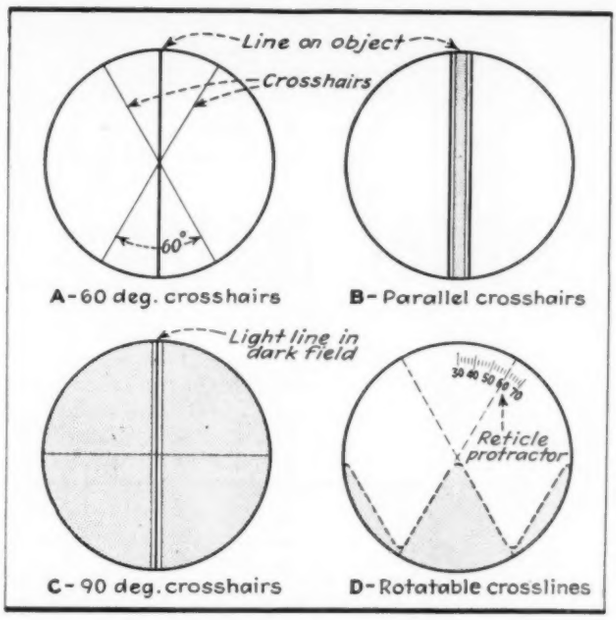


Fig. 5—Different types of eyepiece fields (reticles) are available to suit differing applications of the measuring microscope. Most universally adaptable is the reticle shown at D, *which is used in the Toolmaker's microscope*

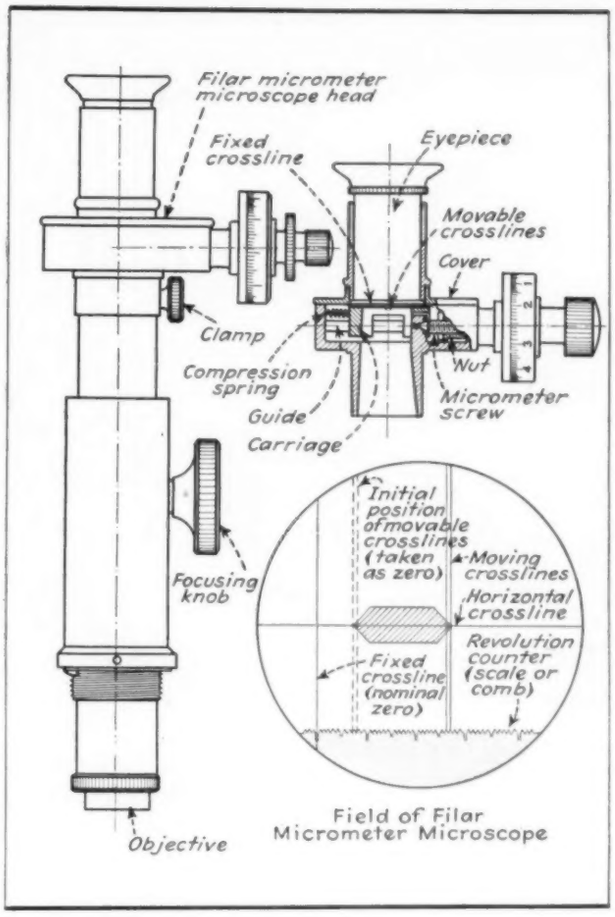


Fig. 6—The filar eyepiece is placed in a standard microscope for measuring the object with a micrometer screw instead of a scale on the reticle

alignment with a similar line on the object. A single crossline is of value in setting on a bright line in a dark field.

The rotatable interrupted crosslines used in the toolmaker's microscope are shown at *D* in Fig. 5. They are rotatable with respect to one another through 360 deg.; the rotation is measurable to ½ deg. by the reticle protractor scale, and to 1 min. of arc by the large protractor circle mounted in the flanged housing as shown in Fig. 4. Settings are made easily on lines or contours, either as shown at *A* in Fig. 5, or by using the edge of the contour to bisect longitudinally the reticle crosslines as at *D*.

The measuring element of the filar micrometer microscope is a filar eyepiece micrometer available separately, as well as in combination with a calibrated microscope. A small carriage bearing a pair of parallel crosslines is moved across the field of the eyepiece on accurate guides by means of a micrometer screw. On the shaft of the screw is mounted, friction tight, a drum with a suitable number of graduations, usually 100. A fixed single or double cross line is placed at the zero point of the measuring field. The crosslines are all in the focal plane of the eyepiece and appear superimposed on the magnified image.

A comb or scale in the field of view indicates the number of revolutions of the micrometer screw; sometimes an external counter is supplied for this purpose.

Ordinary measurements are made by successively setting the movable crosslines at the opposite ends of the object being measured. The graduated drum can be set to zero at the initial point of measurement. Great precision of measurement can be obtained by using the filar micrometer microscope in conjunction with a standard scale, the microscope serving to subdivide the scale. Since the drum can be graduated to order, and the magnification chose to meet a particular condition, the micrometer microscope is a very convenient method of reading angular scales of any radius.

If p is the pitch of the micrometer screw, n the number of graduations on the drum, and Mo the magnification of the objective in the tube length used, then d, the distance on the object to which each division of the drum corresponds is

$$d = \frac{p}{nMo}$$

Using reasonable care, line settings can be repeated to 0.00001 in. With special precautions higher accuracy is possible. No serious difficulty is experienced in measuring objects down to 0.0001 in. in size, but smaller objects introduce difficulties through diffraction.

A protractor eyepiece is available for measuring angles. This eyepiece has a circle accurately divided in degrees. When rotated, the circle carries with it the 90 deg. crosshairs with which the settings are made. The angular position of the circle is read by a vernier to 3 min. of arc. Delicate rotation is provided by a small pinion which engages the toothed edge of the circle. The crosshairs in this eyepiece are adjustable so that their intersection may be made to coincide with the axis of rotation to any desired degree of accuracy. Linear and angular measurements may be made simultaneously by mounting a scale or filar eyepiece micrometer on the protractor eyepiece.

Suspension of stripper plates

BY JOSEPH S. KARASH, RELIANCE ELECTRIC & ENGINEERING COMPANY

Methods of suspending stripper plates and points in favor of interchangeable punches and dies are covered in this section of a die design series

THE USE OF spring-operated stripper plates often is unavoidable in designing dies. In the case of simple piercing or blanking dies some variation of the stripping schemes suggested in the three previous articles of this series can be utilized to provide the stripping action. However, in the case of large dies, particularly those of the compound type, the designer's choice sometimes is limited to some type of spring-operated stripper plate. When such a stripper is used it is a question whether to use stripper bolts, Fig. 16*A*, or socket-head cap screw, Fig. 16*B*, to suspend the stripper plate to keep it flush with the edge of the punch, washers are placed under the heads of the stripper bolts.

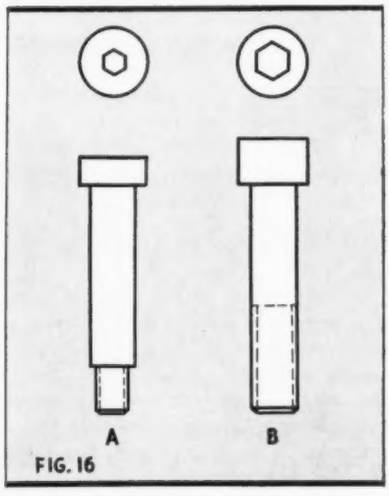


Fig. 16—Stripper plates may be suspended by bolts, as at A, or by socket-head cap screws, B, each having certain advantages

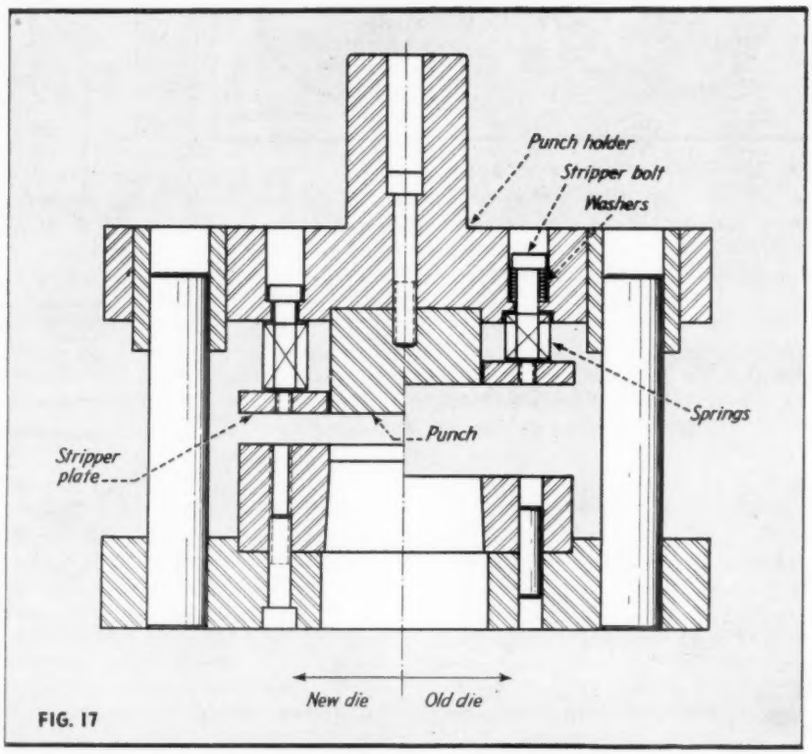


Fig. 17—Stripper bolts are used in this design, which is shown as it appears when new and after it has been used and reground several times

In order to clearly illustrate the operating difference between the two methods of plate suspension, let us first analyze just what happens during the life of a die when stripper bolts, Fig. 16*A*, are used to provide stripper plate suspension. Shown in Fig. 17 is a design of this type illustrating the appearance of the die when it is new and how the same die would appear after it has been used considerably. It will be noted that:

1. The stripper plate must be dismantled and reassembled every time the punch is sharpened.
2. In adjusting the stripper plate to keep it flush with the edge of the punch, washers are placed under the heads of the stripper bolts.
3. The punch holder periodically must be counterbored to receive the springs.
4. A point sometimes is reached when it is necessary to change to shorter bolts to prevent the heads from striking the face of the ram.

In Fig. 18 is shown the same die with the exception that socket-head cap screws are used for suspending the stripper plate. By comparing the two it can be concluded that the use of socket-head cap screws for plate suspension offers the following:

1. The stripper plate does not have to be dismantled in order to grind the punch. The stripper plate can be retracted by turning the socket-head cap screws as shown at *A*. The punch and the end of the socket-head cap screws then are ground simultaneously. After the grinding operation, the socket-head cap screws are turned back until the stripper plate is flush with the end of the screws and the edge of the punch. The ends of the socket-head cap screws are then prick punched to prevent rotation.

2. No washers are placed under the socket-head cap screws to compensate for punch wear. The compensation automatically is taken care of because the ends of the screws are ground at the same time the punch is ground, the head remaining at the same level regardless of grinding wear.

3. No secondary counterboring is required to receive the stripper springs. The longest practical springs are used when first making the die. The shortening of the springs usually can be taken up in additional spring preloading. In the case of the stripper bolt suspension it would not always be possible to do this, because the length of the spring is limited due to the deep counterboring required to provide room for washers.

4. It would never be necessary to replace the socket-head cap screws with shorter screws, since they are ground to a short over-all length as the punch is sharpened.

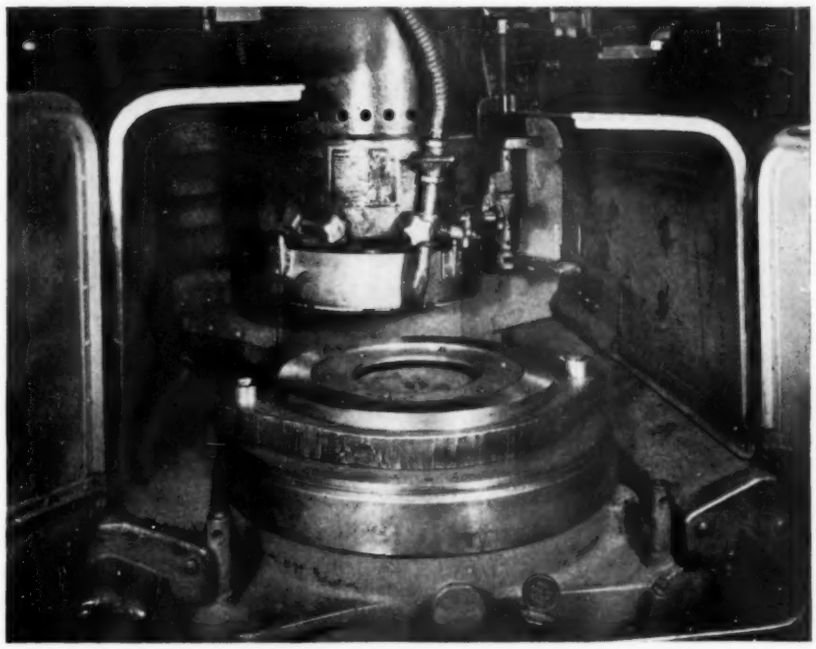


Fig. 19—Here the stripper plate has been retracted so that the die and ends of the socket-head cap screws can be ground simultaneously

A die ready for sharpening on a surface grinding machine is shown in Fig. 19. Note that socket-head cap screws were used for stripper plate suspension. The stripper plate has been retracted to allow the simultaneous grinding of the die and the ends of the socket-head cap screws.

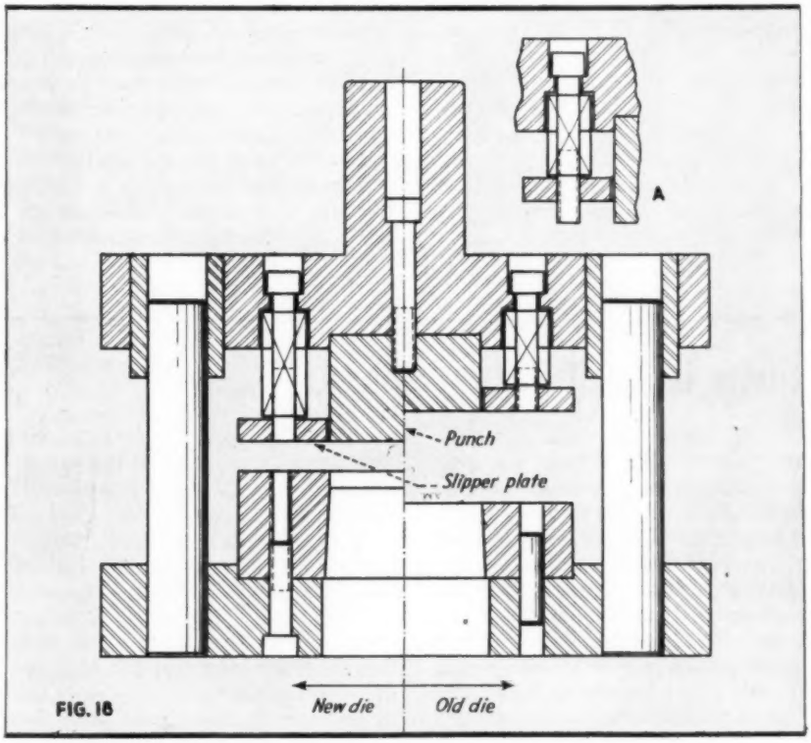


FIG. 18

Fig. 18—This is the same die as shown in Fig. 17, except for the use of socket-head cap screws. Cap screw is turned down as shown at A, and then ground down with the punch

Interchangeable Punches and Dies

The use of interchangeable punches and dies offers possibilities of economy from the standpoint of maintenance cost. The advantages to be gained are based on the fact that these punches and dies are removable easily. Standardized interchangeable punches and dies are obtainable from a number of concerns. The principal difference between the various makes lies in the method used to secure the parts in the die set. Shown in Fig. 20 is a typical example of a set-up using a purchased punch and die with "home-made" punch and die pads. From the standpoint of maintenance cost, the advantages of such a design are:

1. Both the punch and die can be sharpened without removing the punch holder and die shoe from the press.

2. Punches and dies can be replaced at very little cost.

3. Sharpening can be done on a small grinding machine, thus not tying up a larger machine in grinding extremely small parts.

4. The punch and die can be replaced to punch a variety of hole sizes in the same die set without disturbing the set-up. This indirectly reduces

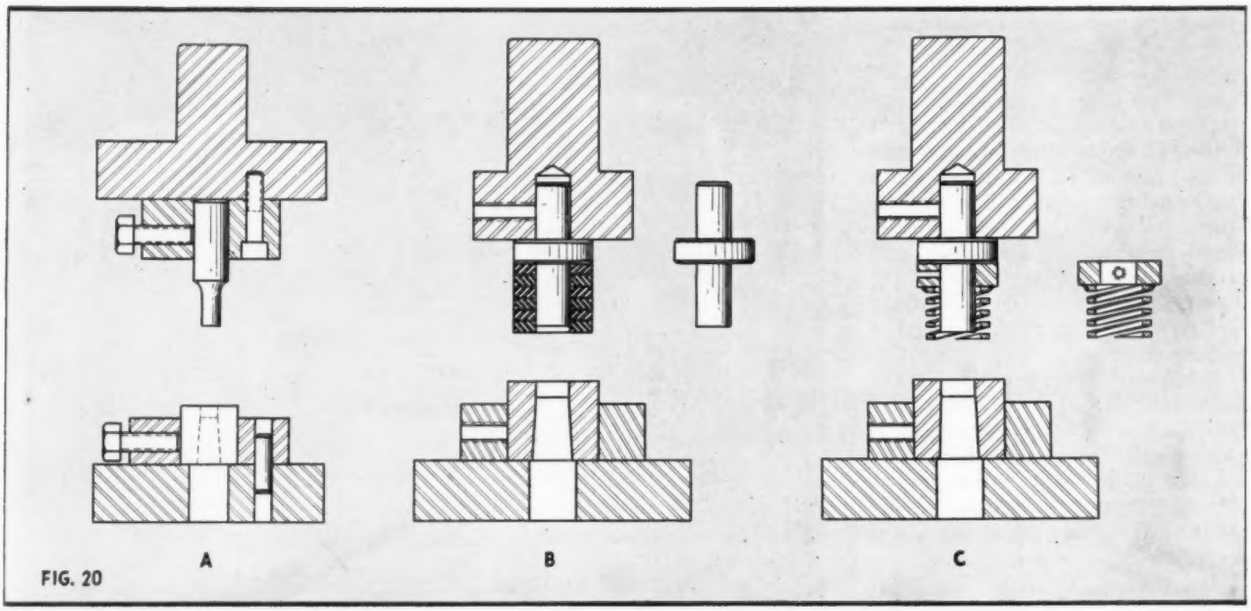


Fig. 20—Interchangeable punches and dies offer many economies because they can be removed readily, and, with some ingenuity, may be equipped with strippers which improve their performance

maintenance cost, because a smaller number of die sets require less handling and less storage space.

In using interchangeable punches and dies it sometimes is desirable to use a laminated rubber stripper. The type of punch shown in Fig. 20*A* is not ideally adapted to this because of the radius on the punch body. The rubber stripper would have no shoulder to stop against, and consequently would keep creeping up the body of the punch. Designs of interchangeable punches which are adapted to strippers are shown in Figs. 20*B* and 20*C*. By comparing these two designs to the type shown in Fig. 20*A* it can be concluded that they have the following potential advantages:

1. The stripping force is exerted against the lower shoulder of the punch, and consequently has no tendency to pull the punch out of the punch-holder. The set-screw need only hold the weight of the punch in the holder.

2. The punching force is taken on the back of the punch shoulder. Consequently, the punch can be held in a drilled hole without the use of a punch pad. A pad is necessary when using some types of punches because the force is taken on the back end of the punch. The pad is used so that the punch can have a level, hard surface to stand on.

3. The punch holder is simple and can be made of a round piece of machine steel with very little machining required.

4. The shoulder type of punch is ideal for use with either the laminated rubber stripper or the removable spring stripper, thus utilizing the potential advantages of removable stripper, both from the standpoint of maintenance and initial costs.

5. In none of the die maintenance schemes shown is there any intention of suggesting methods which are slipshod or haphazard. The methods suggested all have their advantages and if applied judiciously should result in a better control of die maintenance cost.

Most designers take pride in their work and have a natural tendency to make every design a masterpiece, complete with guide posts and all extras. However, it is necessary to recognize the law of economy. At times this takes the form of suppression of artistic tendencies in order that the parts can be made economically.

Large Repairs in Small Railway Shops

STREAMLINE TRAINS and small railway terminal shops hardly seem to go together. But just as another example of the way in which railway shop men handle locomotive maintenance with a lack of facilities, that would stump many in other lines, note the work of the Trascoti shop of the Gulf, Mobile & Northern railway in Mobile, Ala. This is the regular terminal of one 600-hp. power unit with a six-cylinder McIntosh & Seymour diesel as the motive power, and two other power units come here whenever they need attention—which isn't very often.

There is no pit as low elevation above tidewater makes drainage difficult. So they built a track that runs the unit high enough to get under to work whenever necessary. A few husky timbers and old rails supplied the necessary material.

Motor repair, however, is done from the top of the car, through trap doors or hatches. For this work the unit is put on a ground level track, and a storage battery mobile crane used to lift cylinder heads, pistons and rods out through the roof.

Motors are repaired, or serviced, on the progressive plan. When new rings or cylinder liners are needed, they start at one end and repair the first cylinder between runs. Then the next cylinder is renewed, and the whole engine finished in six days, without missing a single run. Rod bearings are also scraped at the same time, when necessary. Those in charge state that maintenance costs are less than with steam locomotives, and have largely overcome any doubt as to the reliability of the diesel.

Incidentally this same road has found the 2–10–2 freight locomotives built for the old Russian government in about 1918, very efficient as revenue producers.

No apprentices?

BY WALTER F. SIMON, SUPERVISOR OF APPRENTICESHIP
INDUSTRIAL COMMISSION OF WISCONSIN

Maybe you haven't the time, the money, nor the inclination to train apprentices. But isn't it your loss as well as theirs?

MANUFACTURING PLANTS can grow old and feeble just like workers. The infirmities of old age are more likely to creep unnoticed upon shops located in small communities, though those in larger centers are not immune.

For lack of new blood and of a training program, many plants are dying on their feet. They are run by veteran superintendents and foremen some of whom haven't had a new idea in twenty years. Worse, nobody can tell these old-timers anything new about their jobs. Foreman training classes may help, but isn't this starting at the wrong end of the line?

Some men are able to remain mentally alert all their lives, but too often the opposite is true. It is only natural that we should want to continue doing things as we first learned to do them years ago. Nevertheless, in this swiftly moving age it is fatal to pass the learning stage. Waste and inefficiency always follow.

When I visit one of these aging plants I marvel that it can remain in business. Probably it can keep going on its reputation and on the support of old and faithful customers.

If it can survive despite inefficient personnel and antiquated production methods it certainly has capacity for growth. It has a running start on all newcomers. Actually, some of these concerns are in a most advantageous position, but the management doesn't seem to realize it. Bring in some up-and-coming young men, put them through a modern apprenticeship program, and these old established shops could show their heels to some of the newer and less stable organizations.

Then there are the younger shops which, when they do operate, are always so busy they have no room, no time, no inclination to employ apprentices. They simply can't be bothered about training anybody. While local boys would gladly give anything to learn a trade, and while many able-bodied men are on relief, these concerns find it most expedient to bring in skilled men from outside. This often means that outsiders bring in trouble with them.

Another common type of shop is the one which employs "learners" instead of apprentices, although the management resents the inference that the learners are not in fact apprentices. Investigation usually discloses the arrangement to be a one-sided affair. There is no written agreement, which means that the employer assumes no obligation to train the boy. Dismissal can occur any time, with or without cause. There is no definite understanding as to when the term of apprenticeship is completed, no agreement covering periodic wage increases, no promise to shift the learner from one machine or operation to another.

A "piece-work crazy" learner rarely develops into a competent machinist

Proportionately few of these learners ever develop into competent mechanics. The reason is obvious. As the learner becomes efficient on one machine he begins to earn a fairly good wage. He may even become "piece-work crazy," as one plant apprentice supervisor puts it. Earning good money and lacking judgment, he wants to stay where he is. As his production increases, his employer also is satisfied to keep him where he is, and that makes it unanimous. But in the end the employer must pay a penalty. He has a shop full of machine operators, and practically no mechanics.

It is indeed disgraceful to have on one hand an unprecedented number of unemployed young people and on the other an ever-increasing scarcity of skilled men. Is it any wonder that the youth movement is gaining momentum? It is a cock-eyed condition to which business men might well give attention. In the last analysis what do young people want except a job and such practical training as will enable them to become self-supporting? Since only industry can supply this demand, the least industry can do is to examine the feasibility of more widespread youth training.

Often we hear it said that state and federal laws make it difficult to hire apprentices. Yes, if one desires to employ boys fourteen or fifteen years old and pay them next to nothing, then trouble will be encountered in some states. But let's be reasonable. That difficulty won't apply to a bona-fide 1940 model apprenticeship system based on experience and not on something we read in books.

State apprenticeship laws cannot be classed as detrimental to apprentice training. Only nine states have such legislation, and in each case it is voluntary in application. None requires the employer to enter into an agreement with his apprentices. None specifies an hourly or weekly wage rate. None determines the ratio or number of apprentices. None attempts to tell the employer what he shall teach his apprentices. In short, these laws simply set up certain recommended minimum standards.

Let me repeat, these are voluntary standards. The employer has a choice of using or disregarding them, or of not employing any apprentices at all.

Many consider the federal Wages

and Hours Act as the country's No. 1 apprenticeship "restricter." But the facts do not support this belief. The administrator of the law has ruled that apprentices may be employed at a beginning wage of less than 30 cents an hour provided the standard established by the Federal Committee on Apprenticeship be met and that a special exemption be secured from the Wage and Hour Division for each apprentice.

The four standards referred to are:

1. There must be a written agreement between apprentice and employer. This is nothing new. Centuries before Columbus discovered America there was an agreement of that kind in every apprenticeship. The principles of apprenticeship have not changed any more than has human nature. When an employer, acting in good faith, promises a boy an opportunity to learn a trade, why should he hesitate to put the promise in writing? Federal standards say that the agreement must contain statements as to term of training, schedule of processes or divisions of the trade to be taught, amount of part-time school attendance, and the scale of wages.

2. Apprentice wages must be based on the prevailing skilled rate in the same trade and community. The requirement is that in the course of his term the apprentice be paid an amount equal to half that earned by the skilled worker during the same period.

3. The apprentice must attend a public school 144 hours per year or a total of 576 hours in a four-year term. Lately there has been a modification of this requirement. The recommendations now provide simply that there shall be "adequate" supplemental related instruction but that 144 hours per year is "desirable." Classroom instruction consists of related technical information such as shop mathematics, drawing, blue-print reading and other subjects to enable the apprentice to develop into a competent mechanic. The employer is not compelled to pay for time so spent. Furthermore, the employer is not prevented from cooperating with the school to see that his apprentices get the kind of instruction needed. Incidentally, in industries and communities which for years have sent apprentices to school part-time, an apprentice in his third year knows more about the theory of his trade than most of the mechanics with whom he works. The employer even mildly interested in the welfare of his apprentices will find no reason to object to this schooling. After all, he benefits from it too.

4. A schedule of training must cover the parts of the trade to be learned. The standards do *not* lay down any hard and fast rules in this respect, nor do they prescribe particular schedules. To become a machinist, for example, the apprentice must master the operation of about eight basic machines common to every machine shop. The standards require the agreement to specify those machines and the approximate time to be spent on each. If the agreement says six months shall be spent on lathes, it means six months' experience on lathes in the course of the term of training—not six consecutive months. The schedule can be varied to suit the particular shop.

To secure the exemption necessary to employ the apprentice at less than 30 cents an hour, copies of the agreement together with an application must be sent to the Hearings Branch of the Wage and Hour Division. If the standards previously mentioned have been observed, the exemption is a matter of a few days' time.

Worth 30 Cents an Hour

If an apprentice is paid 30 cents an hour, an employer need not concern himself about federal apprenticeship requirements. Actually, a bona-fide apprentice is worth that amount as a beginner. In Wisconsin, for example, about 1,300 apprentices are under agreement in the metal trades. The beginning rate is 30 cents an hour or more, and this is a voluntarily paid wage which was in effect before the Wages and Hours Act. Our employers are no more and no less charitable than those in other states and we must assume, therefore, that they consider the wages paid apprentices a reasonable rate. All Wisconsin agreements meet federal apprenticeship standards and exceed them in some respects. For example, the apprentices are paid full wages for time spent in school.

Somebody might rise to say, "Yes, but that is one of the requirements under your apprenticeship law." True enough, but remember that the law is voluntary in application. The employer need not enter into agreement with his apprentices if he does not see fit. But the fact remains that we have 1,300 agreements in the metal trades alone. Furthermore, apprentices are sent to school not merely 144 hours a year or 576 in four years—records of 800 to 1,000 hours' attendance on full pay are made almost daily. Lately one employer graduated two toolmaker apprentices with records of 1,087 and 1,137 hours of schooling. Both boys, after serving the standard four-year terms, turned around and signed another two-year agreement for a sort of post-graduate course in tool estimating at a beginning wage of 65 cents an hour. This means more school attendance, too. Upon graduating, these boys will have acquired training and experience such as no school in the world can provide. At the same time, the employer will have men he needs and can get in no other way.

Employers will do well to use services of the Federal Committee on Apprenticeship. This agency is prepared to offer whatever assistance is needed to inaugurate a training system. It will send, free of charge and with no strings attached, sample agreements and all the necessary technical information. It can advise whether any state organizations have been set up to promote apprenticeship. Should an employer see fit not to use any of the literature or advice offered by this agency, that's his privilege.

What about child labor legislation? Since the apprentice will be a high school graduate, he will be about eighteen years of age and therefore the usual prohibited employments are not likely to apply to him. As for restrictions on hours of labor, it is not logical that any employer would expect his apprentices to work longer hours than other employees. In the manufacturing industries the work week is well below the maximum set by state laws.

Workmen's compensation laws apply alike to apprentices and other workers.

Unemployment compensation laws operate in favor of apprenticeship. The man whose experience is limited to only one or two machines naturally is one of the first to be laid off when work slows down. The man who has served an apprenticeship and has acquired all-round training and experience can easily be shifted to a variety of jobs and thus retained in employment for a longer period.

Instead of laws which might be construed as detrimental to the employment of bona-fide apprentices, there is an astonishing scarcity of laws designed to protect the interests of potential apprentices. In other words, boys wishing to learn trades are the ones entitled to do the crying.

Do the unions oppose apprenticeship? The answer depends on the kind of apprenticeship the employer attempts to promote. If he refuses to sign apprenticeship agreements, if he tries to employ boys at low wages without at the same time furnishing the kind of training the apprentices have a right to expect, then the unions object and rightfully so. But if the employer acts in good faith, he will

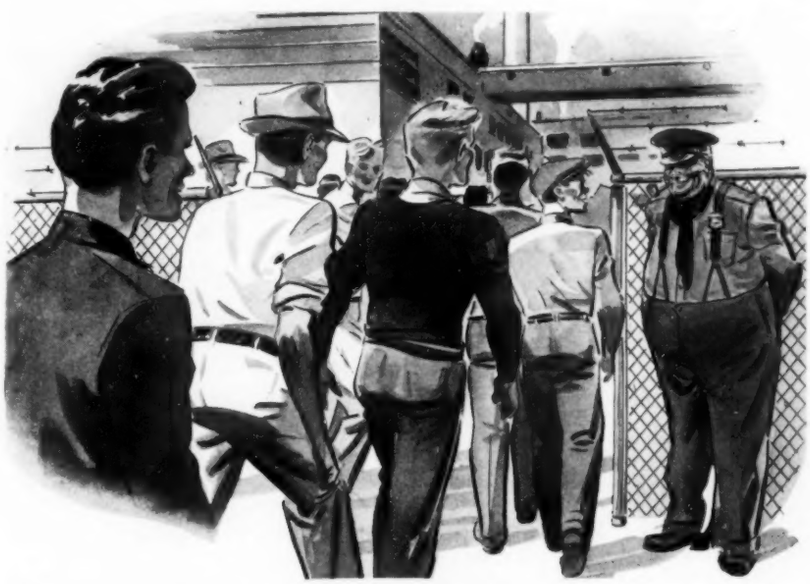
find the unions ready to meet him half way.

Mention was made of 1,300 metal trades apprentices under agreement in Wisconsin. To the best of my knowledge, every one is employed in shops organized by either the C.I.O. or the A.F. of L. Not a single shop in the state is employing as many apprentices as the working agreement between the management and the union permits. Isn't that sufficient evidence to prove that the unions are more liberal in this respect than they need be? The employers too are liberal in that they employ no more apprentices than the industry can absorb. However, those apprenticeships which are in force are all genuine and therefore organized labor lends its wholehearted support.

What happens to apprentices when a reduction in working force becomes necessary? Since the tendency is to spread the work among as many men as possible rather than lay anybody off, the apprentice simply takes his medicine with the rest of the employees. If the work week is reduced to four days, then the apprentice also works four days, which will extend his apprenticeship period proportionally.

The apprenticeship problem must be approached with an open mind. What complicates matters is the fact that many men in supervisory positions have never served a genuine apprenticeship. This is illustrated when an employer argues that his mechanics and foremen cannot take time to instruct apprentices. I served an 11,000-hour apprenticeship in patternmaking, and do not hesitate to say that what I learned from journeymen and foremen I could put in my eye and never notice. Apprentices learn by doing and not by watching or being told. Again, an employer may say an apprenticeship system is too expensive. The truth is that in a four-year term, the apprentice will earn a satisfactory profit for his employer.

The care used in selecting applicants largely determines the success of an apprenticeship program. So-called vocational guidance has little connection with this problem. Apprentices should not be selected on the basis of past experience acquired in some other shop or in some trade school. In judging applicants the employer should keep this question in mind: "What qualities does this fellow possess which will make him valuable to my organization ten or fifteen years from now?"



Even a rumor of a chance to learn a trade will bring a flock of applicants

Good character is of first importance. A likeable personality is necessary. The apprentice who cannot get along with those around him is sunk before he begins. Has he the initiative to go ahead without continually asking for instructions? Is he trustworthy? Can he readily understand orders? Is he willing to assume responsibility? Is he physically fit?

These qualifications should be carefully examined. No employer can expect a perfect score in this respect, but there is always a three or four month probationary period.

Educational entrance requirements should be high school graduation or better. An oral examination will eliminate 75 per cent of the applicants, and a written test will tell the rest of the story.

Where to find applicants? Even a rumor of a genuine opportunity to learn a trade will bring a flock of applicants. There are so many well qualified young fellows looking for work that the employer could set the entrance requirements sky-high and still get all the boys he could use.

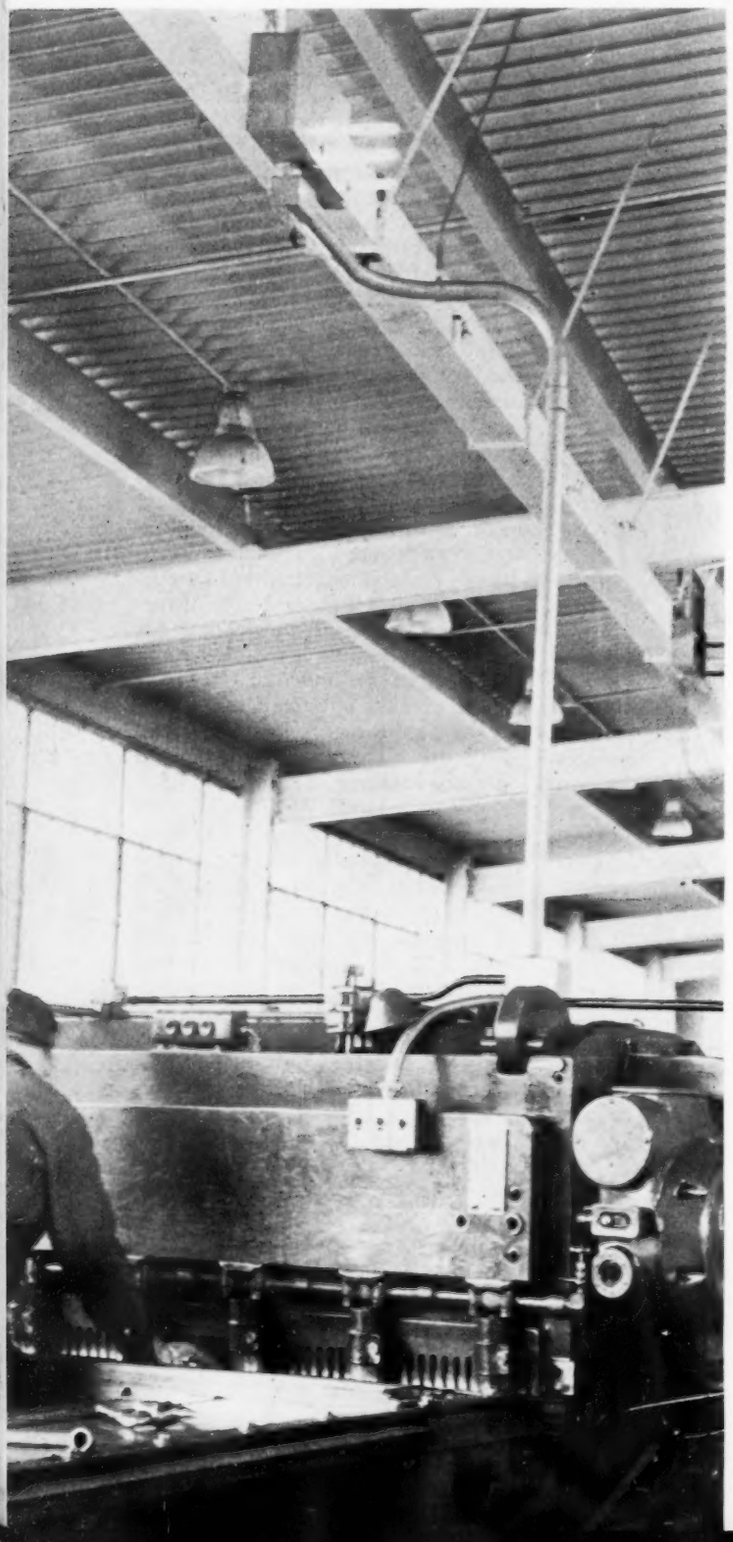
While mapping out a training plan may involve a few technicalities, there is nothing particularly difficult about it. Almost every manufacturing plant needs better mechanics, a better supervisory staff and better salesmen who know the company's product from the ground up. The basic training should be the same for all three classifications. It should be as diversified and at the same time as thorough as the plant's facilities will permit. Some boys will not have the ability nor the desire to be more than skilled mechanics. In four years' time all their qualities will come to the surface. If any have a sense of leadership and ability to carry responsibility they will clearly demonstrate their capabilities.

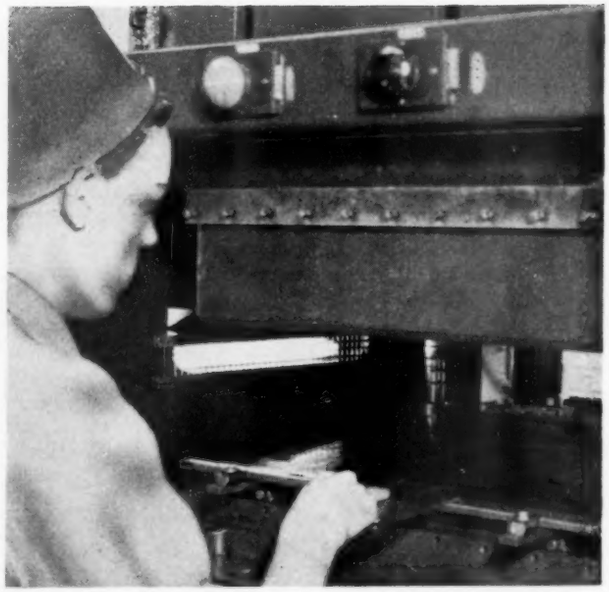
Speaking of leadership, it is the one thing the apprenticeship movement lacks. There is need for such leadership among educators, trade unions, industrial management, yes, and in the government itself. From the standpoint of national defense, in this regard the lack of foresight displayed by the government is nothing short of dismaying. Warfare today is on a mechanized footing, as is so plainly being demonstrated in Europe. Not only must there be plenty of mechanics to build the tools of war but mechanical training is rapidly becoming part of the individual soldier's preparation for effective service.

During this national emergency we shall see all sorts of hare-brained schemes advanced for the training of highly skilled men. We probably shall see millions of dollars and much precious time wasted until the government learns how to coordinate its efforts in solving this problem. Most of the plans now under consideration may help to produce semi-skilled workers but there is no known short-cut system of producing toolmakers, patternmakers and other craftsmen. Must we, therefore, wait three or four years before we can create a toolmaker? Yes, if we want toolmakers. But remember that properly selected, supervised and trained apprentices begin producing almost immediately. That being the case, we might just as well make each apprenticeship a genuine one. If we do that we shall have a mighty useful program left us long after the emergency has passed.

Shop Shots

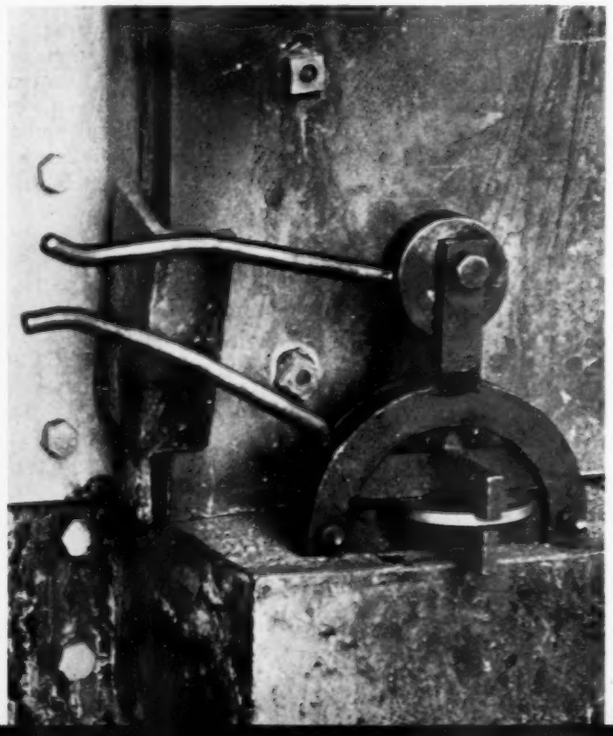
In shearing departments machine operators generally require three types of service, so a signal system using three different colored tubular lights was devised. On the press are three switches, each connected to an individual light on the roof truss. The top (red) light indicates that the operator wants the truck, the center (white) light indicates that the foreman is wanted, while the lower (green) light indicates that the crane or steel handler is needed. Courtesy A. F. Erickson, works manager, All-Steel-Equip Company

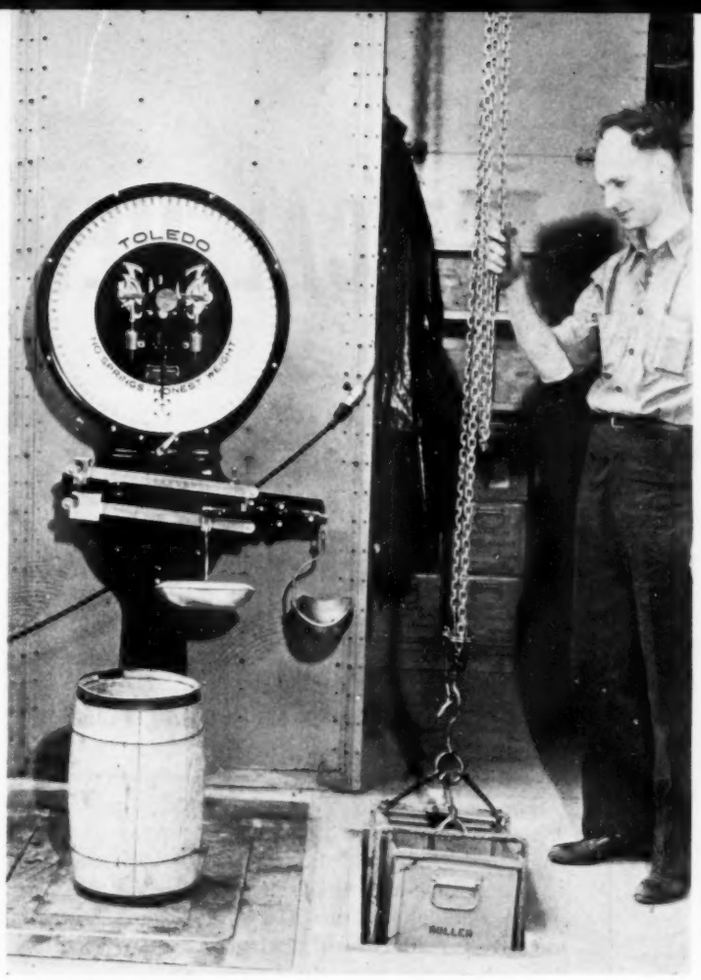




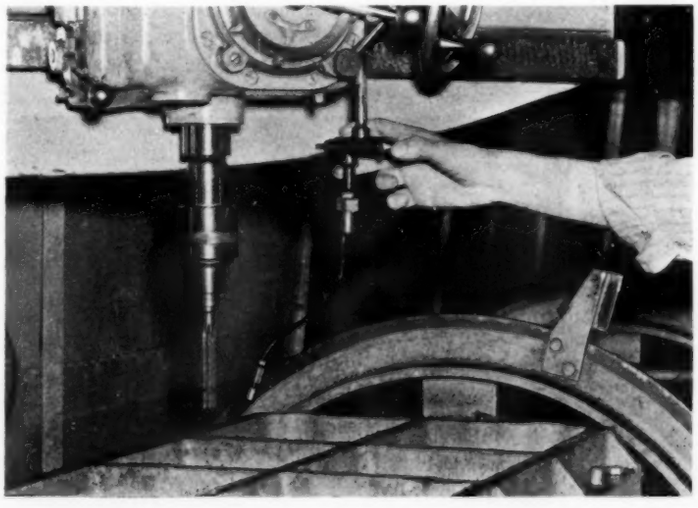
Getting good lighting on dies in a press is often difficult. One solution is effected by placing a fluorescent tube inside each column of the press. The protecting wire screen slides in and out of a sheet-metal frame for easy servicing. Courtesy A. F. Erickson, All-Steel-Equip Company

Trouble with warping is often experienced in quenching thin steel disks. Since the quantity involved at any one time may be too small to warrant special equipment, this simple clamp was devised for holding a 3/16-in. steel disk while being quenched. The upper spider is held against the disk by a cam and lever, which when released allows the plunger to be pulled up by a coil spring. A ball bearing welded to the end of the plunger is held by fingers on the spider so that it can tilt slightly and allow for inequalities in the disk. Courtesy W. A. Butterworth, Barnes Drill Company





This portable scale is made into a floor scale by placing it into a concrete-lined pit. The scale is held in place and the pit kept covered by a collar of welded ¼-in. steel plate. Another shallow pit alongside the scale makes it possible to transfer parts to stacking boxes with minimum lifting. Boxes rest on rollers in the bottom of a carrier which hangs from the chain hoist. An overhead monorail leads to the shelves where the stacking boxes are kept, right. Hoist and rollers in the carrier make it easy to move boxes in and out, while flared lips on the boxes make them easy to stack. The monorail extends over the scale so that it can easily be lifted from the pit. Courtesy George A. Horton, All-Steel-Equip Company



Radial drills are equipped with convenient plunger-type oilers to provide controlled amounts of lubricant for drilling, reaming or tapping holes in engine blocks. A welded sheet metal oil reservoir is mounted on the drill head. Courtesy Caterpillar Tractor Company

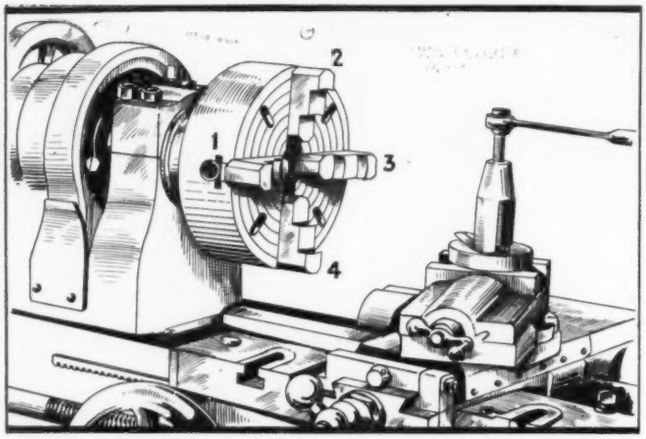
Many railroad men will recognize this one. Dies and other odd-shaped parts are stored in racks alongside walkways between two departments. When someone walks too near the extended steel pieces he brushes against a row of ropes suspended from the ceiling as a warning. Courtesy A. F. Erickson, All-Steel-Equip Company

IDEAS FROM PRACTICAL MEN

Rapid Centering a Four-Jaw Chuck

By STANLEY W. WORTHINGTON

Many mechanics do not like to use the independent four-jaw chuck because of the time needed to center the work. If a definite routine is followed in centering the work, rapid and positive adjustment is possible.



Work can be centered quickly in the independent four-jaw chuck by using two keys and following the author's procedure for adjusting the jaws

I have found that the best routine to follow is the one explained below:

First, catch the work in a pair of opposite jaws, Nos. 1 and 3 in the illustration.

Second, adjust jaws Nos. 2 and 4 until they touch the work lightly.

Third, using two keys at the same time for jaws Nos. 1 and 3, loosen one and tighten the other so as to move the work in the desired direction without having it drop out of the chuck.

Fourth, revolve the chuck one-quarter of a turn, tighten jaws Nos. 2 and 4, and loosen No. 1 slightly.

Fifth, using two keys in jaws Nos. 2 and 4 loosen one and tighten the other to move the work in the desired direction.

Sixth, tighten jaw No. 1.

Rough center the work first by eye, bringing the punch mark or center hole as nearly opposite the dead center as possible, and then make the fine adjustment with the test indicator. When using the indicator always test opposite points first, using two keys to move the work half the apparent error, following the steps in order given above. That is, with the chuck arranged as shown in the illustration, adjust the test indicator against the work near jaw No. 1 until the needle reads zero. Revolve the chuck a half turn and read the dial when jaw No. 3 is near the indicator. Loosen jaw No. 4 very slightly. Using two keys in jaws Nos. 1 and 3, loosen one and tighten the other so as to move the work half the error.

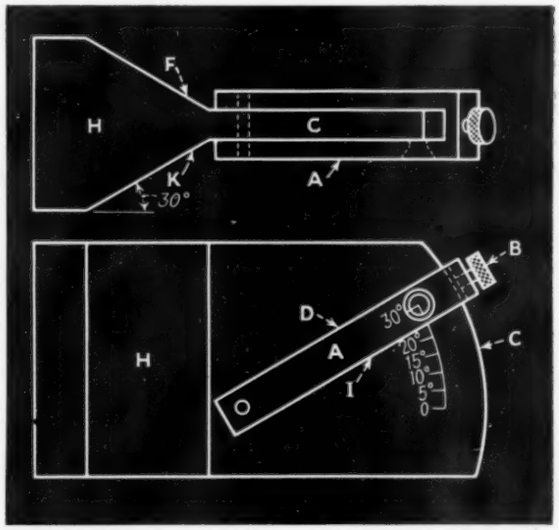
Tighten jaw No. 4. Revolve the chuck one quarter turn so that jaw No. 1 is on top and loosen it very slightly. Using two keys now adjust jaws Nos. 2 and 4 in the same manner as was done with jaws Nos. 1 and 3. Finish by tightening jaw No. 1.

Grinding Correct Angles on Threading Tools

By G. O. HALL, JR.

The device illustrated is for gaging the cutting angles of threading toolbits that are tipped up at an angle in the toolholders. It is obvious that if a toolbit is ground to an included angle of 60 deg., and is then put in a holder that tilts it at an angle, the angle of the thread it will cut will not be correct. By using the device described here, the toolbit can be ground to correct that error.

In operation, the pivoted arm *A* is set to the angle at which the toolbit is tipped up in the toolholder and is locked by the knurled-head screw *B*. The toolbit is laid flat on the graduated plate *C* with its upper edge in contact with the side *D* of the pivoted arm and is slid along it until one side of the cutting edge contacts side *F* of the angular plate *H*. The toolbit is then ground so that side of its cutting edge fits the gage. The opposite side of the cutting edge is gaged by lay-



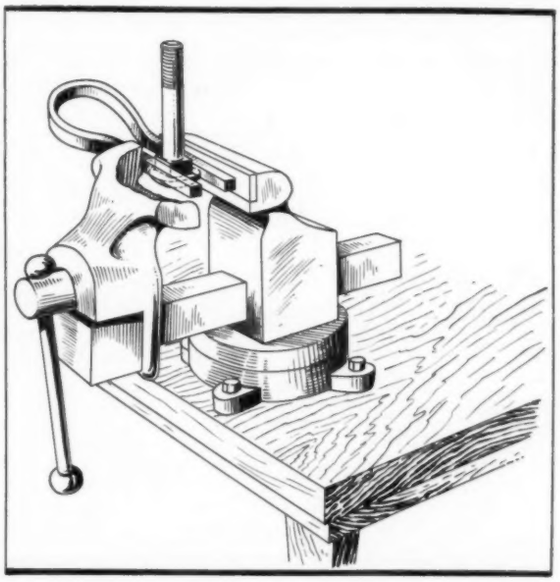
This device shows how to grind the correct angle on a threading tool when it is tilted in the toolholder during the thread-cutting operation

ing the toolbit flat on plate *C* with its upper edge in contact with side *I* of the pivoted arm and is slid along until its cutting edge contacts the angular surface *K* of plate *H*. That side is then ground to fit the gage. After both cutting edges have been ground to fit the gage, it will cut a thread having an included angle of 60 deg. when it is tipped in the toolholder. It goes without saying that when the toolbit is in the toolholder, its top at the cutting end must be ground so as to be parallel with the cross-slide when set in the lathe.

How to Hold Carriage Bolts in the Vise

By WILLIAM A. SPELLMAN

Sometimes it is necessary either to run a die over the damaged threads or to cut more threads farther on carriage bolts having squares under their heads.



In repairing damaged threads on carriage bolts, this spring yoke will permit them to be held in the vise without damage to the heads

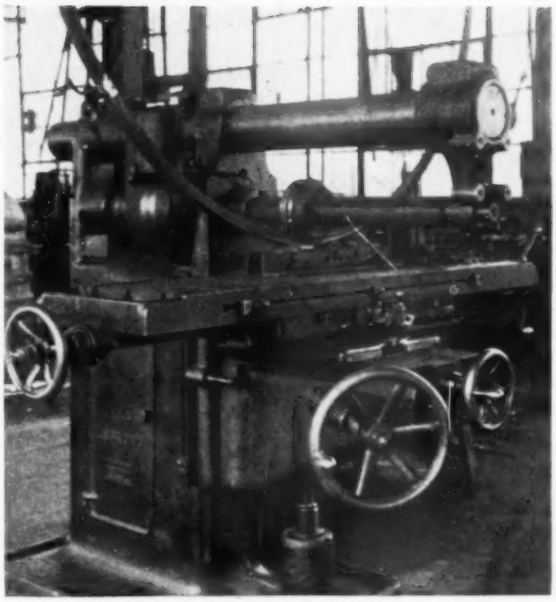
The only difficulty is holding the bolts in the vise without damaging the thin edges of the heads.

If a piece of $\frac{5}{16}$-in. key stock is bent into the shape of a jew's-harp, the ends can be sprung over the square of the bolt and the bolt can be held in the vise without injuring the head, as shown in the sketch. The threads can then be cut as close to the squares as the die will permit.

Rolling T-Section Bars on a Miller

By FRED H. COLVIN

A husky milling machine stands a lot of grief even when it is used on the work it was designed for. Used as a rolling mill for T-section steel is another



Rather than buy a bending roll, this LeBlond Miller was pressed into service to roll 6-ft. diameter rings for electric-sign frames

matter; it can be done if proper tools are used.

The No. 4 LeBlond miller shown is in the shop of the Bayliss Machine Co. in Birmingham, Ala. They make quite a lot of 6-ft. rings for the frame work of electric signs. These are about 2-in. T-section steel and are rolled up as shown. A large grooved roller on the arbor guides the T-bar and also curves it as the supporting rollers on the table are forced up by the knee. These rollers are held between angels as shown. These can be spaced differently as indicated by the holes. After bending to shape the ends are welded.

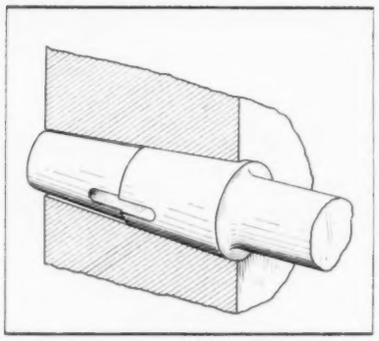
Relieved Piston-Rods Avoid Breakage

By FRANK C. HUDSON

Piston rod breakage is frequently a serious problem on many railroads. The breaks usually occur near the keyway in the crosshead end. One southern railroad shop executive has adopted a practice which he feels is responsible for the elimination of breakage in every rod fitted by the new method. The remedy is very simple, and has worked in every case so far tried.

Instead of trying to secure a fit the whole length of the taper, the half toward the small end is turned down somewhat. This may average $\frac{3}{64}$ to $\frac{1}{16}$ in. although the exact amount is said not to be important. The object is to have the entire bearing surface on the large end of the taper, as indicated in the illustration.

The theory of this relief at the small end is that the driving in of the key spreads or swells the small end. When the small end fits, this puts the bearing on that end and leaves the large end free to "weave" in the crosshead and causes the cracks that start near the front end of the key slot. According to records,



Piston-rod taper relieved as shown, assures a tight fit on the large end. Thus the large end will not weave in the crosshead, thereby eliminating one of the causes of crack propagation in piston rods

the method described, has eliminated piston rod breakage at this point. This procedure has been adopted on the railroad in question.

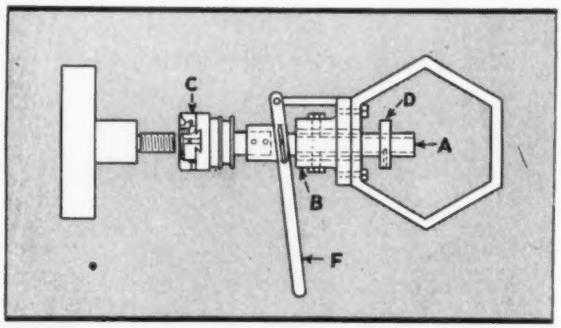
Piston rods are also relieved at the points where the rod packing contact ends. A relief of perhaps 3 in. is turned or ground slightly below normal diameter so that part of the packing rides over the edge of the relief. This prevents the formation of shoulders at the end of the rod travel.

Attachment for Cutting Fine Threads

By A. A. LEONHARDI

The attachment illustrated is for cutting fine threads on work of small diameter in large turret lathes where the movement of the heavy saddle-mounted turret is not sensitive enough for the operator to feel the correct pressure that should be applied in starting the die on the work.

Essentially the device consists of the bar *A* fitted to slide in the bushed boss *B* on one of the turret faces,



The heavy saddle-mounted type of turret lathe is not adapted for cutting fine threads on small work, but with this sensitive attachment such threads can easily be cut

and carrying the self-opening die-head *C* on its outer end and the stop collar *D* near its inner end; and the lever *F* for advancing and retracting the die to and from the work.

In operation, the stop collar is set for the length of the thread to be cut and the die-head is advanced to the work by the operating lever and cuts the thread. After the thread has been cut and the stop collar contacts the inner face of the hollow turret, further advancement of the die is arrested. The die-head then opens and is drawn back to the starting point by the operating lever.

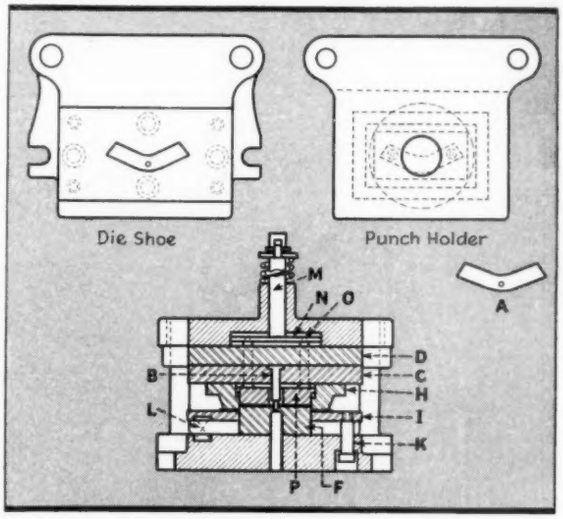
The device is very sensitive and threads can be cut on work of small diameter with it just as easy as in a small ram-type screw machine.

Press Tools for Piercing and Blanking

By WILLIAM B. GREENER

The press tools illustrated were designed for piercing and blanking a large quantity of parts such as the one at *A* from scrap stock.

The tools are mounted in a standard die set and consist of the piercing punch *B* which is inserted in plate *C* and is backed up by plate *D*; the blanking punch F which is mounted on the die shoe and also serves as the piercing die; the blanking die *H* which is attached to the punch holder; the stripper *I* which is



Small parts can often be made from scrap left from blanking larger parts. The work can be done economically by these comparatively simple press tools

guided by the shoulder screws *K* and is operated by springs at *L*; and the knockout *M* which is operated by plate *N* and the pins *O* which are attached to the shedder *P*.

In operation, the scrap stock is placed on the blanking punch. As the ram descends the part is pierced. As the ram continues its descent and nears the bottom of its stroke the part is blanked by the blanking punch as the blanking die passes over it. On the upward stroke of the ram the stripper is forced upward by the springs and strips the waste stock from the blanking punch. The knockout is operated by the knockout bar on the press through pins on the shedder and pushes the part out of the blanking die.

Weights of Metric Steel Sizes in English Units

BY HUGH S. CAMERON

CONVERSION TABLE FOR ROUND, SQUARE, AND HEXAGONAL STOCK

Dimension "a"							
mm	in	kg/m	lb/ft	kg/m	lb/ft	kg/m	lb/ft
5	0.197	0.154	0.103	0.196	0.132	0.170	0.114
6	0.236	0.222	0.149	0.283	0.190	0.245	0.165
7	0.276	0.302	0.203	0.385	0.259	0.333	0.224
8	0.315	0.395	0.265	0.502	0.337	0.435	0.292
9	0.354	0.499	0.335	0.636	0.427	0.551	0.370
10	0.394	0.617	0.415	0.785	0.528	0.680	0.457
11	0.433	0.746	0.501	0.950	0.638	0.823	0.553
12	0.472	0.888	0.597	1.13	0.759	0.979	0.658
13	0.512	1.04	0.699	1.33	0.894	1.15	0.773
14	0.551	1.21	0.813	1.54	1.035	1.33	0.894
15	0.591	1.39	0.934	1.77	1.189	1.53	1.028
16	0.630	1.58	1.062	2.01	1.351	1.74	1.169
17	0.669	1.78	1.196	2.27	1.525	1.96	1.317
18	0.709	2.00	1.344	2.54	1.707	2.20	1.478
19	0.748	2.23	1.499	2.83	1.902	2.45	1.646
20	0.787	2.47	1.660	3.14	2.110	2.72	1.828
21	0.827	2.72	1.828	3.46	2.325	3.00	2.016
22	0.866	2.98	2.003	3.80	2.554	3.29	2.211
23	0.906	3.26	2.191	4.15	2.789	3.59	2.412
24	0.945	3.55	2.386	4.52	3.037	3.92	2.634
25	0.984	3.85	2.587	4.91	3.300	4.25	2.856
26	1.024	4.17	2.802	5.31	3.568	4.60	3.091
27	1.063	4.50	3.024	5.72	3.844	4.96	3.333
28	1.102	4.83	3.246	6.15	4.133	5.33	3.582
30	1.181	5.55	3.730	7.07	4.751	6.12	4.113
32	1.260	6.31	4.240	8.04	5.403	6.96	4.677
33	1.299	6.71	4.509	8.55	5.746	7.40	4.973
34	1.339	7.13	4.791	9.07	6.095	7.86	5.282

Dimension "a"							
mm	in	kg/m	lb/ft	kg/m	lb/ft	kg/m	lb/ft
35	1.378	7.55	5.074	9.62	6.465	8.32	5.591
36	1.417	7.99	5.369	10.2	6.854	8.81	5.920
38	1.496	8.90	5.981	11.3	7.594	9.82	6.599
40	1.575	9.87	6.633	12.6	8.467	10.9	7.325
41	1.614	10.3	6.922	13.2	8.870	11.4	7.661
42	1.654	10.9	7.325	13.9	9.341	12.0	8.064
45	1.772	12.5	8.400	15.9	10.69	13.8	9.274
46	1.811	13.0	8.736	16.6	11.16	14.4	9.677
48	1.890	14.2	9.542	18.1	12.16	15.7	10.55
50	1.969	15.4	10.35	19.6	13.17	17.0	11.42
53	2.087	17.3	11.63	22.1	14.85	19.1	12.84
55	2.165	18.7	12.57	23.8	15.99	20.6	13.84
58	2.283	20.7	13.91	26.4	17.74	22.8	15.32
60	2.362	22.2	14.92	28.3	19.02	24.5	16.46
63	2.480	24.5	16.46	31.2	20.97	27.0	18.14
65	2.559	26.0	17.47	33.2	22.31	28.7	19.29
68	2.677	28.5	19.15	36.3	24.39	31.4	21.10
70	2.756	30.2	20.29	38.5	25.87	33.3	22.38
73	2.874	32.9	22.11	41.8	28.09	36.3	24.39
75	2.953	34.7	23.32	44.2	29.70	38.2	25.67
78	3.071	37.5	25.20	47.8	32.12	41.4	27.82
80	3.150	39.5	26.54	50.2	33.73	43.5	29.23
83	3.268	42.5	28.56	54.1	36.36	46.9	31.52
85	3.346	44.5	29.90	56.7	38.10	49.1	32.99
90	3.543	49.9	33.53	63.6	42.74	55.1	37.03
95	3.740	55.6	37.36	70.9	47.65	61.4	41.26
100	3.937	61.7	41.46	78.5	52.75	68.0	45.70

MANY AMERICAN FIRMS are receiving foreign orders for steel, the specifications for which are in metric units. Since American prices and shipping weights are based on weights expressed in English units, metric weights of the metric steel sizes must be converted into English units. This is often a tedious task. To facilitate converting metric weights and sizes into English units, the following tables have been prepared to determine (1) the weight in pounds per foot of metric steel sizes, and (2) that steel size in English units nearest the steel sizes specified in metric units. The values in the tables are based on the specific weight of steel = 7.85 kilograms per cubic decimeter = 490 lb. per cu. ft., and 1 kilogram per meter = 0.672 lb. per ft.

One of the tables gives the weights of round, square and hexagonal steel bars. The metric dimensions in millimeters and weights in kilograms per meter are given, together with the corresponding English dimensions in inches and weights in pounds per foot. For example, a 23-mm. hexagonal bar weighs 3.59 kilograms per meter, which is equivalent to 2.412 lb. per ft.; the width across the flats is 0.906 in.

The table on page 547 gives the weights of flat plates in different widths and thicknesses. Metric sizes and weights are given, together with their English equivalents. For example, the weight in English units of a 32x25-mm. plate weighing 6.28 kilograms per meter is 4.220 lb. per ft.; the size is 1.299×0.984 in.

Dimension "a"		Round		Square	
mm	in	kg/m	lb/ft	kg/m	lb/ft
105	4.134	68.0	45.70	86.6	58.20
110	4.331	74.6	50.13	95.0	63.84
115	4.528	81.5	54.77	104	69.89
120	4.724	88.8	59.67	113	75.94
125	4.921	96.3	64.71	123	82.66
130	5.118	104	69.89	133	89.38
135	5.315	112	75.26	143	96.10
140	5.512	121	81.31	154	103.5
145	5.709	130	87.36	165	110.9
150	5.906	139	93.41	177	118.9
160	6.299	158	106.2	201	135.1
170	6.693	178	119.6	227	152.5
180	7.087	200	134.4	254	170.7
190	7.480	223	149.9	283	190.2
200	7.874	247	166.0	314	211.0
210	8.268	272	182.8	346	232.5
220	8.661	298	200.3	380	255.4
230	9.055	326	219.1	415	278.9
240	9.449	355	238.6	452	303.7
250	9.843	385	258.7	491	329.9

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AMERICAN MACHINIST REFERENCE BOOK SHEET

Weights of Metric Steel Sizes in English Units

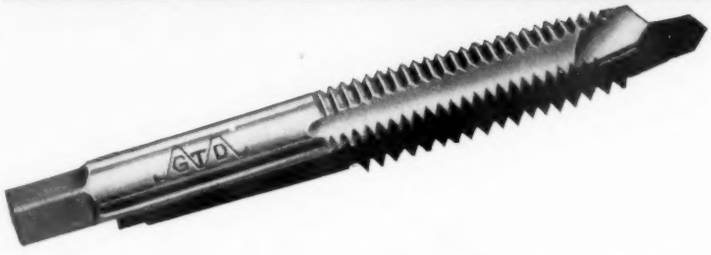
CONVERSION TABLE FOR FLAT STOCK

Width a	*Thickness b*													
mm	5	6	8	9	10	11	12	15	20	25	30	40	50	60
in.	*0.197*	*0.236*	*0.315*	*0.354*	*0.394*	*0.433*	*0.472*	*0.591*	*0.787*	*0.984*	*1.181*	*1.575*	*1.969*	*2.362*
10	0.393	0.471	0.628	0.707	0.785	←					Kilograms per meter			
0.394	*0.264*	*0.317*	*0.422*	*0.475*	*0.528*	←					Pounds per foot			
12	0.471	0.565	0.754	0.848	0.942	1.04	1.13							
0.472	*0.317*	*0.380*	*0.507*	*0.570*	*0.633*	*0.699*	*0.759*							
14	0.550	0.659	0.879	0.990	1.100	1.21	1.32							
0.551	*0.370*	*0.443*	*0.591*	*0.665*	*0.739*	*0.813*	*0.887*							
15	0.589	0.707	0.942	1.06	1.18	1.30	1.41	1.77						
0.591	*0.396*	*0.475*	*0.633*	*0.712*	*0.793*	*0.874*	*0.948*	*1.189*						
16	0.628	0.754	1.01	1.13	1.26	1.38	1.51	1.88						
0.630	*0.422*	*0.507*	*0.679*	*0.759*	*0.847*	*0.927*	*1.015*	*1.263*						
18	0.707	0.848	1.13	1.27	1.41	1.56	1.70	2.12						
0.709	*0.475*	*0.570*	*0.759*	*0.853*	*0.948*	*1.084*	*1.142*	*1.425*						
20	0.785	0.942	1.26	1.41	1.57	1.73	1.88	2.36	3.14					
0.787	*0.528*	*0.633*	*0.847*	*0.948*	*1.055*	*1.163*	*1.263*	*1.586*	*2.110*					
22	0.864	1.04	1.38	1.56	1.73	1.90	2.07	2.59	3.46					
0.866	*0.581*	*0.699*	*0.927*	*1.048*	*1.163*	*1.277*	*1.391*	*1.740*	*2.325*					
25	0.981	1.18	1.57	1.77	1.96	2.16	2.36	2.94	3.93	4.91				
0.984	*0.659*	*0.793*	*1.055*	*1.189*	*1.317*	*1.452*	*1.586*	*1.976*	*2.641*	*3.300*				
28	1.10	1.32	1.76	1.98	2.20	2.42	2.64	3.30	4.40	5.50				
1.102	*0.739*	*0.887*	*1.183*	*1.331*	*1.478*	*1.626*	*1.774*	*2.218*	*2.957*	*3.696*				
30	1.18	1.41	1.88	2.12	2.36	2.59	2.83	3.53	4.71	5.89	7.07			
1.181	*0.793*	*0.948*	*1.263*	*1.425*	*1.586*	*1.740*	*1.902*	*2.372*	*3.165*	*3.958*	*4.751*			
32	1.26	1.51	2.01	2.26	2.51	2.76	3.01	3.77	5.02	6.28	7.54			
1.299	*0.847*	*1.015*	*1.351*	*1.519*	*1.687*	*1.855*	*2.023*	*2.533*	*3.373*	*4.220*	*5.067*			
35	1.37	1.65	2.20	2.47	2.75	3.02	3.30	4.12	5.50	6.87	8.24			
1.378	*0.921*	*1.109*	*1.478*	*1.660*	*1.848*	*2.029*	*2.218*	*2.769*	*3.696*	*4.617*	*5.537*			
38	1.49	1.79	2.39	2.68	2.98	3.28	3.58	4.47	5.97	7.46	8.95			
1.496	*1.001*	*1.203*	*1.606*	*1.801*	*2.003*	*2.204*	*2.406*	*3.004*	*4.012*	*5.013*	*6.014*			
40	1.57	1.88	2.51	2.83	3.14	3.46	3.77	4.71	6.28	7.85	9.42	12.6		
1.575	*1.055*	*1.263*	*1.687*	*1.902*	*2.110*	*2.325*	*2.533*	*3.165*	*4.220*	*5.275*	*6.330*	*8.467*		
45	1.77	2.12	2.83	3.18	3.53	3.88	4.24	5.39	7.07	8.83	10.6	14.1		
1.772	*1.189*	*1.425*	*1.902*	*2.137*	*2.372*	*2.607*	*2.849*	*3.622*	*4.751*	*5.934*	*7.123*	*9.475*		
50	1.96	2.36	3.14	3.53	3.93	4.32	4.71	5.89	7.85	9.81	11.8	15.7	19.6	
1.969	*1.317*	*1.586*	*2.110*	*2.372*	*2.641*	*2.903*	*3.165*	*3.958*	*5.275*	*6.592*	*7.930*	*10.55*	*13.17*	
55	2.16	2.59	3.45	3.89	4.32	4.75	5.18	6.48	8.64	10.8	13.0	17.3	21.6	
2.165	*1.452*	*1.740*	*2.318*	*2.614*	*2.903*	*3.192*	*3.481*	*4.355*	*5.806*	*7.258*	*8.736*	*11.63*	*14.52*	
60	2.36	2.83	3.77	4.24	4.71	5.18	5.65	7.07	9.42	11.8	14.1	18.9	23.6	28.3
2.362	*1.586*	*1.902*	*2.533*	*2.849*	*3.165*	*3.481*	*3.797*	*4.751*	*6.330*	*7.930*	*9.475*	*12.70*	*15.86*	*19.02*
70	2.75	3.30	4.40	4.95	5.50	6.04	6.59	8.24	11.0	13.7	16.5	22.0	27.5	33.0
2.756	*1.848*	*2.218*	*2.957*	*3.326*	*3.696*	*4.059*	*4.428*	*5.537*	*7.392*	*9.206*	*11.09*	*14.78*	*18.48*	*22.18*
80	3.14	3.77	5.02	5.65	6.28	6.91	7.54	9.42	12.6	15.7	18.9	25.1	31.4	37.7
3.150	*2.110*	*2.533*	*3.373*	*3.797*	*4.220*	*4.644*	*5.067*	*6.330*	*8.467*	*10.55*	*12.70*	*16.87*	*21.10*	*25.33*
90	3.53	4.24	5.65	6.36	7.07	7.77	8.48	10.6	14.1	17.7	21.2	28.3	35.3	42.4
3.543	*2.372*	*2.849*	*3.797*	*4.274*	*4.751*	*5.221*	*5.699*	*7.123*	*9.475*	*11.89*	*14.25*	*19.02*	*23.72*	*28.49*
100	3.93	4.71	6.28	7.07	7.85	8.64	9.42	11.8	15.7	19.6	23.6	31.4	39.3	46.8
3.937	*2.641*	*3.165*	*4.220*	*4.751*	*5.275*	*5.806*	*6.330*	*7.930*	*10.55*	*13.17*	*15.86*	*21.10*	*26.41*	*31.45*
110	4.32	5.18	6.91	7.77	8.64	9.50	10.4	13.0	17.3	21.6	25.9	34.5	43.2	51.8
4,331	*2.903*	*3.481*	*4.644*	*5.221*	*5.806*	*6.384*	*6.789*	*8.736*	*11.63*	*14.52*	*17.41*	*23.18*	*29.03*	*34.81*
120	4.71	5.65	7.54	8.48	9.42	10.4	11.3	14.1	18.9	23.6	28.3	37.7	46.8	56.5
4.724	*3.165*	*3.797*	*5.067*	*5.699*	*6.330*	*6.989*	*7.594*	*9.475*	*12.70*	*15.86*	*19.02*	*25.33*	*31.45*	*37.97*
130	5.10	6.12	8.16	9.19	10.2	11.2	12.3	15.3	20.4	25.5	30.6	40.8	51.1	61.2
5.118	*3.427*	*4.113*	*5.484*	*6.176*	*6.854*	*8.026*	*8.266*	*10.28*	*13.71*	*17.14*	*20.56*	*27.42*	*34.34*	*41.13*
140	5.50	6.59	8.79	9.89	11.0	12.1	13.2	16.5	22.0	27.5	33.0	44.0	55.0	66.0
5.512	*3.696*	*4.428*	*5.907*	*6.646*	*7.392*	*8.131*	*8.870*	*11.09*	*14.78*	*18.48*	*22.18*	*29.57*	*36.96*	*44.35*
150	5.89	7.07	9.42	10.6	11.8	13.0	14.1	17.7	23.6	29.4	35.3	47.1	58.9	70.7
5.906	*3.958*	*4.751*	*6.330*	*7.123*	*7.930*	*8.736*	*9.475*	*11.89*	*15.86*	*19.76*	*23.72*	*31.65*	*39.58*	*47.51*

MORE PRODUCTION with "GUN" TAPS

When an eastern aircraft manufacturer needed to thread these brass barrels, "*Gun*" Taps were chosen. Why? Because tests proved that "*Gun*" Taps had the combined accuracy and stamina to meet the stringent requirements of the job. Cutting a 10-32 thread through this long barrel requires quite a tap. Special long shank ground thread "*Gun*" Taps were the answer. They churn through at the rate of 550 R.P.M. and turn out two finished jobs every minute. The average production is 6,000 parts per tap—with 1,000 between grinds.

Has your plant a tough job—in brass, bronze, iron, steel, plastic or fiber? "*Greenfield*" engineers can help you lick it. Ask for suggestions.



GREENFIELD TAP & DIE CORPORATION., Greenfield, Mass.

Detroit Plant: 2102 West Fort St. Warehouses in New York, Chicago, Los Angeles and San Francisco. In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ont.

GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES · PIPE TOOLS

Tell John Public The Truth

JOHN PUBLIC is on a bender. He was recently seized with the fear that he would be caught defenseless in a world in which the strong arm is supreme. When he told the government how scared he was, the administration and Congress took him into the lounge and poured out a succession of soothing drinks—billions upon billions for planes, guns, tanks, ammunition, ships.

Pretty soon he was feeling good. He relaxed comfortably under the soothing influence of the billions, believing everything was all right. BUT, what about the morning after? What about the time a few months hence when he wakes up with a headache and a bad taste in his mouth to learn that those appropriated billions haven't yet been translated into war goods?

The answer is that he is going to howl like thunder. That is, he will kick up an awful fuss unless he is told the truth NOW. And the truth is that it will take at least a year or more before manufacture of munitions is set up and rolling on a sizable scale. There is grave doubt whether it can be done that fast.

Even if it is assumed that things go along smoothly, red tape is cut, and the mistakes of 1917-18 avoided, it still will be a year before any worthwhile results can be expected.

This obvious fact is no secret. The Army and Navy know it. Many New Dealers know it. Industrialists know it. But precious little is being done to get across that hard cold fact to the public.

Packard has accepted a Rolls Royce aircraft engine contract for which it will require ten months to tool up. Westinghouse has pointed out that it cannot prepare to make munitions in less than four months to two years. Automobile manufacturers say that few if any of their machines could be turned to producing anything other than motor cars without virtual reconstruction. They emphasize, "To switch from producing passenger automobiles to airplanes, for instance, would in general be accomplished as fast and as well by building new plants as by conversion of existing facilities."

Why not tell the public the reasons why such long delays are inevitable? Most people know less than nothing about tooling up a plant or about the complex problem involved in starting manufacture of a wholly unfamiliar product.

The National Association of Manufacturers has taken the first step. It has secured the cooperation of news reel companies in showing dramatically the exacting task of making tools, dies, fixtures, and machine tools which must precede actual production of munitions.

That, however, is only a beginning. It is a one-time shot. What needs to be done is to use all possible national, regional and local media to tell the story of the tooling process so that John Public can grasp it.

There is no time to waste. The job must be done quickly, before his glow wears off and he begins asking questions. Each one of us can do a service by telling the true story to our neighbors and townspeople, to our local newspaper editors, and to all those who contact the general public.

If the public is promptly given the facts about the situation, industry is less likely to be blamed for not doing the impossible.

Burnham Finney

GAGING BUSINESS

Machine tool builders take short cuts to speed up deliveries. British reported planning to store some machines here. Navy accelerates placing of machinery contracts. Orders are large

Machine Tools—The Army and Navy will continue indefinitely to rely upon the voluntary cooperation of the machine tool industry to get what it wants rather than institute a mandatory priority system. That fact was established at meetings in Washington the past week. Various short cuts are being taken by builders to speed up deliveries of machines vital to defense requirements, especially large planers and boring mills. Orders for big machines roughly estimated at five million dollars will be allotted this week by one branch of the government. The Navy hopes to put machine tool contracts running into millions into the hands of the industry within ninety days, whereas normally the time for placing such business extends over nine to ten months. Having taken over all French orders, the British are reported planning to store some U. S. machine tools upon completion until they know exactly what they want to do with them. Shipments are contemplated to Canada and Australia as well as to England, while many machines probably will be installed in U. S. factories with British contracts. The export licensing system recently put in force has caused much confusion and delay in shipments from Builders' plants. Machine tool bookings continue at recent high levels, with inquiries excellent. A shortage of certain types of skilled machinists in metal-working plants is becoming more acute.

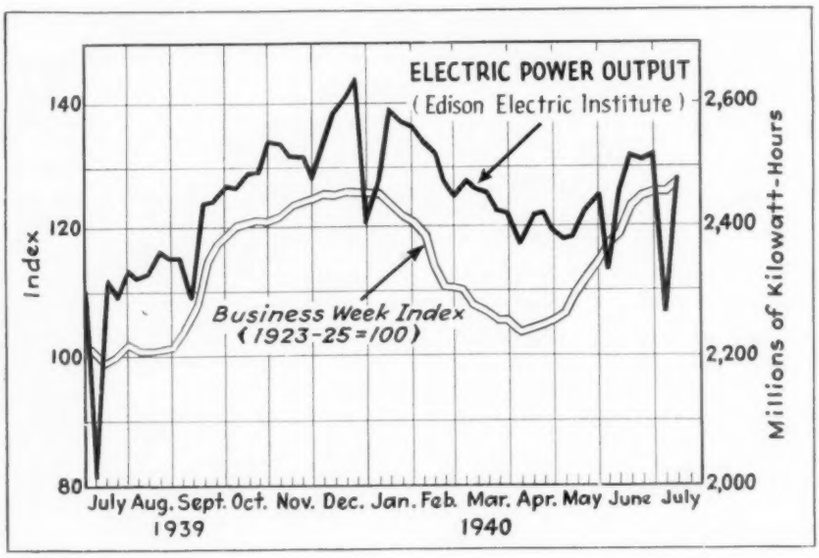
Munitions—Placing of orders by the Army and Navy is well under way. The Army Ordnance Division has available for its program $653,688,617, and the Ordnance Department of the Navy $164,594,478. New appropriations proposed by the President but yet to be enacted by Congress will give further cash and contractual authority amounting to $1,502,455,645 to the two Ordnance Departments, all but $60,293,000 being earmarked for the Army. The government's new powder-making plant apparently is to be located close to Louisville, Ky. American Car & Foundry has secured an army order for 627 more light tanks to cost around $11,000,000. The company now is producing almost 1,000 tanks for the U. S. Government. Volume production of the Garand rifle soon will be speeded up when the Winchester Company gets into full swing, supplementing the output at the Springfield Armory. Two orders totaling over $7,000,000 have been awarded for gun carriages. Armor plate manufacture is being expanded to meet the government's increased needs, particularly for battleships and tanks.

Farm Equipment—The industry is going into its usual slack season. Tractor manufacture, however, continues active, with some makers just now beginning to cut down their backlogs of orders. Haying and harvesting equipment sales are still good, with industry showing great interest in new machinery for handling green silage. International Harvester has been experimenting with one model, and Allis-Chalmers has announced new equipment for this phase of farm mechanization. Harvester expects to complete expansion of its East Moline works for production of its new small combine by early fall. It has purchased new machinery for its works at Chicago designed to increase production of small tractors 60 per cent.

Railroad Equipment—Freight cars ordered during the first half of 1940 totaled about 10,585 units, compared with 9,000 for the same period a year ago. One hundred eighty-seven locomotives were booked, against 152 last year. Illinois Central has placed a contract for 1,000 steel box cars with the Bessemer, Ala., plant of Pullman-Standard Manufacturing Company. Union Pacific is inquiring for 1,000 ballast cars, and Atlantic Coast Line for 1,665 freight cars. The Reading is expected to buy 10 diesel electric switchers.

Steel—Though steel ingot operations are not far from 90 per cent, the full force of the defense program will not be felt for some months. Production is likely to stay close to the current level in the immediate future. Some increase is being made in electric furnace melting capacity since alloy steels will play a vital role in defense efforts.

Aircraft—Standardization of plane types, now agreed upon by the Army and Navy, should help to accelerate production. Eager to expand their output plane makers are scouring the country for machinists and machine operators bidding against older industries for their services. One important engine maker is known to be considering a new factory in the middle west to employ 10,000 men, supplementing its present facilities. Ford is authoritatively reported to have abandoned all plans for entering any phase of mass production of airplanes or plane parts. Newest entry into the field of aircraft parts is Briggs Manufacturing Company, well-known automobile body builder.



2 Billions for Airplanes, 1½ for Ordnance, Are Big Features in New Defense Request

If granted, new-sought-for appropriation of $5,000,000,000 would double year's defense budget, provide 19,000 more planes

WASHINGTON — The President has asked Congress to buy the country two billion dollars worth of airplanes and a billion and a half dollars worth of ordnance. This request was the big feature of a five-billion-dollar appropriation asked by Mr. Roosevelt which will double this year's defense budget to provide equipment for an army of 1,200,000 men and the most-hard-to-get stuff for 800,000 more.

The airplane money, $2,023,402,000, will purchase 19,000 additional planes, 15,000 for the Army and 4,000 for the Navy. Of $106,246,000 for the Signal Corps, the larger part is for radio equipment to go in the airplanes. An ordnance figure of $1,552,456,000 includes substantial sums for the armament of the new airplanes, but will mostly cover tanks, munitions and artillery. The engineer service will have an extra $42,296,200 to spend on searchlights, portable bridges, trenching machine and the like.

For expansion of plants to produce military equipment, $325,000,000 is sought, to be spent at the discretion of the Secretary of War. This brings to more than a half-billion dollars the amount available for this purpose, plus an indeterminate part of the President's $200,000,000 blank check.

A start is made on the huge expansion of the Navy just authorized by Congress with an appropriation of $178,000,000. Most of this sum will be used for construction of shipways, armor plants and other production facilities, since the country's shipbuilding capacity is already full.

The shore construction program of the Navy for the next fiscal year runs to more than $200,000,000. The Navy will have authority in this program to negotiate contracts on a cost-plus-fixed-fee basis, the fee not to exceed six per cent. It is not definite that all contracts under this program will be let on a negotiated basis, even though legislation empowers the Navy to do so if conditions should warrant. Where time permits, certain bids will be taken as usual.

Programs for defense to date include both the A and B plans of the government for mobilization of industry. The A program is the initial production needed for a million men. The B program, if carried out complete, would involve equipment for an army of four million men. Thus the appropriations now before Congress call for rounding out the A program and taking on a slice of the B program. Some observers erroneously refer to the current five-billion-dollar request of the President as the B program.

No Priorities for Machine Tools To be Established at This Time

WASHINGTON — No legal priorities for machine tools will be established by the Federal government at this time. This decision was made at meetings held in this city during the past week and participated in by the army, navy and representatives of the industry.

The government will continue to rely upon the voluntary cooperation of the industry to see that its armed forces and private industry with munitions contracts secure machine tools when they need them. The industry itself put cooperative action into effect early in June when it proposed formation of the Machine Tool Coordinating Committee composed of representatives from the industry and from government.

Export License Exemptions Allowed by State Department

WASHINGTON—The Division of Controls of the Department of State has advised collectors of customs throughout the country that no licenses will be required for export of the following articles: 1. Portable tools driven by fractional horsepower motors or by compressed air; 2. Brakes, rolls, shears, and small punches if hand-operated; 3. Repair parts for machine tools other than important sub-assemblies in quantities not sufficient to constitute a substantially complete metal-working machine of the character mentioned in the President's proclamation of July 2 in unassembled form; and 4. Small tools such as cutters, drills, taps and grinding wheels.

Much confusion has arisen regarding the way in which the export licenses are granted. Application must be made direct to the Department of State, but approval is given by the Administrator of Export Control in consultation with the Army and Navy Munitions Board. It is not necessary to secure a separate license for each machine exported, only for each shipment made within a specified time, such as a week, to the same destination.

It is reported several thousand letters of inquiry pertaining to export licenses have piled up at the Department of State. Extra shifts have been employed to take care of this extraordinary volume of correspondence.

British Combine

"Roll out the Barrel" —*As industrial Britain continues the production speed-up of anti-aircraft guns, an ordnance factory in England houses a group of 3.7 A.A. guns to be fitted with breachblocks*

Government Plans to Finance Expansion; Three Separate Methods Being Considered

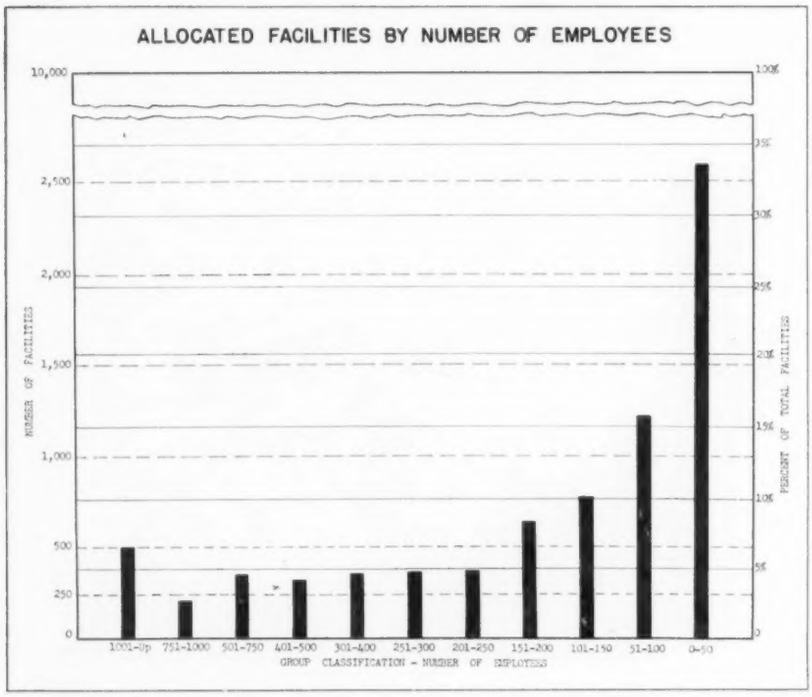
WASHINGTON—Now that the general dimensions of the armament program are becoming clear and that appropriations are beginning to be translated into orders, thoughts are turning to the methods by which the immense expansion of plant that will be needed can be achieved. It is generally assumed that private finance cannot provide the money. Bankers and investors don't want to put their money into facilities that might be made useless by a disarmament conference; manufacturers don't want to assume big debts, or increase their capitalization. Government is getting ready to do the job.

Three quite distinct methods are being developed. So far there is almost no coordination between them and only a rather vague differentiation of function. RFC has received authority to make loans for expansion of defense plants. The Army and Navy have been authorized to make advances up to 30 per cent of the face value of defense contracts. And there is more than a half billion dollars of federal money available for outright government financing.

In general it appears that RFC loans will finance most plant expansion. The advances will mostly be used for working capital. The government will pay for facilities having no commercial utility at all—such things as plants to make smokeless powder and special railroad cars to carry tanks. These last will be owned by the government and operated by private industry, probably under a leasing arrangement.

RFC loans bear 4 per cent interest and are amortizable over three to seven years. Loan Administrator Jesse Jones told AMERICAN MACHINIST that the amortization term will conform to the amortization rates Congress sets up when it acts on the tax bill. The President has suggested a term of five years. Although RFC officials refuse to commit themselves, it appears that the sole security for the loans will be a mortgage on the facilities built with the proceeds of the loan; the borrower will not have to pledge his general credit. This means that if the armament boom blows up, RFC rather than the manufacturer is stuck with the excess plant. Some manufacturers will probably make this doubly sure by setting up subsidiary corporations to borrow money and build plant which will then be rented to the parent corporation.

Except that salaries paid by borrowers must be "reasonable" there are not supposed to be any management strings on RFC loans. Whether recommendations as to location and the like will be attached to defense commission certifications remains to be seen.



Little Fellows *are to get their share of government orders, as this chart shows. Much of the work has gone to shops having less than 50 men*

NEW DEFENSE CONTRACTS

WASHINGTON — Among recent outstanding defense contracts awarded by the War and Navy departments are the following: Spartan Aircraft Co., Tulsa, Okla., $1,859,880 for airplanes; National Supply Co., Holmesburgh, Pa., $219,100 for engines; Baldwin Locomotive Works, Philadelphia, Pa., $268,010 for hydraulic press; and Mine Safety Appliances Co., Pittsburgh, Pa., $207,722 for submarine escape apparatus.

Shortage of Labor May Hinder Packard in Making Plane Engines

DETROIT—Packard was still negotiating with the government last week for a contract to build 9,000 Rolls-Royce engines, president M. M. Gilman being empowered by the board of directors to reach an agreement. Incidentally, letters from stockholders and outsiders apparently uphold Mr. Ford's position in respect to building engines for the British. But Packard is interested in getting a contract that will not leave it holding the bag if the war should be over soon.

Doubtless Packard will eventually sign a contract when satisfactory terms are concluded. Not the least of its troubles then will be to secure the 14,000 men envisaged for peak Rolls-Royce production. It is likely that Packard has 15,000 employees available, of which 10,000 are needed in current automobile manufacturing and 5,000 are on the secondary list.

It is said that at least six weeks will be required for the Packard organization to redraw the British prints to American standards. Outside engineering skill regards this estimate as conservative. One of the greatest jobs, if not the greatest, is to determine the type of fixtures most adaptable to a given problem, in order to maintain aviation standards of accuracy and to be suitable for interchangeable use on machine tools. In some cases, several fixtures will probably be used on the same machine for operations like tapping and drilling somewhat similar pieces. Obviously full consideration of the numerous factors involved in securing maximum utility, productivity and accuracy of fixture and machine set-ups requires a high degree of tool engineering experience. Likewise time. It may be months before Packard is able to show concrete results from the planning stage.

Ford is reported going ahead quietly upon development of a simplified engine after his experience in drawing up production plans for the Rolls Royce. It is said that possibly two of these engines will soon be finished in the toolroom.

Canada Speeds Ship Construction, Pushes Expansion of Facilities

MONTREAL—When the Canadian government last January appropriated $50,000,000 for a wartime shipbuilding program, it scheduled 64 submarine chasers and 26 minesweepers to be completed within two years. Originally deliveries were to start in November. Actually, due to a speed-up ordered last spring, deliveries have already begun. During the last week of June at Montreal Canadian Vickers launched the first of the new boats. Three more were launched the following week. The schedule now calls for deliveries every week from various shipyards. Today government announcements speak of an 82-ship program this year rather than the 100 planned in the two-year project.

At an estimated cost of a little more than $500,000 each submarine chasers are being built by the following: Kingston, Ont., and Collingwood, Ont. shipyards, 46; Davie Shipbuilding Co., Lauzon, 10; Canadian Vickers, Montreal, 8; Marine Industries, Sorel, 7; and Morton Engineering Co., Quebec, 6. Minesweepers which are to cost about $620,000 each are being built in shipyards, inactive heretofore, in British Columbia, and at the Great Lakes.

At the beginning of the war Britain advanced $50,000,000 for plant expansion in Canada. To supplement this, large appropriations for production facilities have also been advanced by the Canadian government. (Because such investments will have a dubious value after the war private capital is not interested.) At a cost of several million dollars Canada will build a huge plant for the production of war chemicals at Beauharonis near Montreal, and although the government will own the plant, it will be operated by the Canada Wire & Cable Co. The government will take all production at a cost basis.

Although the speed-up in war material production is well under way, 24-hour schedules are still the exception. To counteract the shortage of trained men in the machine tool industry, federal money is being used by provincial governments to train thousands of young men this summer in special courses for aircraft production and other skilled trades. However some observers indicate that Canadian industry shall be able to pull en masse in the war effort by this fall.

To further aid a united war effort strikes and lockouts have been outlawed by the Canadian government for the duration of hostilities. A regulation which applies to all companies requires each labor dispute to be submitted to a federal conciliation board on which labor and the employer is represented.

Down Beat—*Metallurgical improvements frequently bring interesting results to unusual industries. To secure a more rapid production of spun shapes for brass horns, trombones, etc., engineers recommended the use of spinning forms closely cast to shape in Mechanite metal*

MURRAY ENTERS AIRCRAFT FIELD

DETROIT—Murray Corporation of America has formed an aircraft division under direction of Richard C. Gazely. One wing of the Russell Street plant will be used for aircraft assembly work. The Briggs Manufacturing Company will produce at its Detroit plant complete metal wing assemblies for scout planes for Vought - Sikorsky Division of United Aircraft Corporation.

TUNGSTEN SHORTAGE POSSIBLE

TOKYO—To date the Japanese have conquered one-third of China, which produces most of the world's supply of tungsten. Despite the fact that China's principal mines are still out of Japan's reach, it is highly possible that the mines may soon fall into Nippon's hands.

Tungsten exports have been one of the most important factors in the financing of China's imports of war materials from the U. S. and elsewhere.

U. S. Government Contracts Awarded to Tool Makers

(Defense Contracts on Page 548j)

Contractor	Gov't Agency	Commodity	Amount
The Buda Co., Harvey, Ill.	Norfolk Navy Yd.	Parts for diesel engines.	$28,822
Foote Bros. Gear & Machine Corp., Chicago, Ill.	TVA	Valve machinery	37,060
Caterpillar Tractor Co., Peoria, Ill.	QMC	Tractors	77,860
Jones & Lamson Machine Co., Springfield, Vt.	Ordnance	Turning lathe	21,106
The Toledo Machine & Tool Div. of E. W. Bliss Co., Toledo, Ohio	Ordnance	Cupping press	25,796
Gisholt Machine Co., Madison, Wis.	Navy	Lathes, turret	22,351
Brown & Sharpe Mfg. Co., Providence, R. I.	Navy	Machines, milling	48,196
Jones & Lamson Machine Co., Springfield, Vt.	Ordnance	Lathes	61,493
American Hoist & Derrick Co., St. Paul, Minn.	Navy	Winches	26,968
International Engineering Inc., Dayton, Ohio.	Air Corps	Stand assembly, engine overhaul	20,023
Smith-Courtney Co., Richmond, Va.	Engineer Corps	Boring mill	23,018
Smalley-General Co., Bay City, Mich.	Ordnance	Milling machines	23,588
Kearney & Trecker Corp., Milwaukee, Wis.	Ordnance	Milling machines	57,284
Allis-Chalmers Mfg. Co., Milwaukee, Wis.	Panama Canal	Pumping units	172,589
The National Acme Co., Cleveland, Ohio	Ordnance	Automatic machines	35,996
Caterpillar Tractor Co., Peoria, Ill.	Navy, Marine Corps.	Tractors	62,640
The C. H. Gosiger Machinery Co., Dayton, Ohio	Air Corps	Drill presses	21,735
International Harvester Co., Inc., Washington, D. C.	Procurement	Tractor	55,243
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio	Ordnance	Milling machines	62,618
The Toledo Machine & Tool Div. of E. W. Bliss Co., Toledo, Ohio	Ordnance	Presses	21,651
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, Ohio	Ordnance	Milling machines	73,332
International Harvester Co., Chicago, Ill.	Ordnance	Tractors	32,873

Federal Training Agencies Coordinated To Increase Skilled Labor for Defense

WASHINGTON—Given an adequate supply of materials, human skill is the other main ingredient of the defense program. The National Defense Commission has set up a "labor problems and labor training" division, headed by Sidney Hillman, which has taken over the problem of expanding the supply of skill. This is being done by coordinating the efforts of four government agencies which were already engaged in training programs. These four agencies are the Education Office of the Federal Security Agency; the National Youth Administration; the Civilian Conservation Corps; and the Federal Committee on Apprenticeship of the Department of Labor.

If necessary, facilities can be made available to train 1,500,000 people, creating employment opportunities for qualified unemployed, and voluntary retraining for present workers. As shortages develop in certain skills, the Hillman office will concentrate on opening the bottleneck.

Who Can Do What?

First problem is to determine skills of employables. Classification of 5,500,000 registered workers is being made by the Employment Service of the Security Agency. Feasibility of testing skills is being considered. If they are tested they will be rated accordingly for the employment reserve. Quick development of high skills can best be accomplished in industry itself through an in-service training program under which workers would be moved up through on-job training and vocational courses, says Mr. Hillman. Plants now train relatively few employees, he states.

Recent appointment by Mr. Hillman of a Labor Policy Advisory Committee, consisting of representatives of AFL, CIO and the Railway Labor Executives Association, gives organized labor the voice it demands in defense policy. Labor leaders have agreed to cooperate, if they are permitted to maintain their labor standards and put their unemployed members to work. The labor unions, especially the machinists, opposed government training of more men because they said thousands of their trained members were still unemployed. The Committee therefore recommended that an inventory of experience and skills be undertaken at once, the result to be available to private industry, and that in so far as possible, the allocation of orders for defense materials be distributed to make full use of unemployed workers.

Training Agencies Cooperate

The job of coordinating training agencies has been assigned to Floyd W. Reeves, Mr. Hillman's executive assistant for labor supply. Mr. Reeves is director of the American Youth Committee, a non-governmental organization, and also is a professor of administration at Chicago University. Owen D. Young is chairman of the Youth Committee, an agency for the welfare of young people.

Most important of the skill-building organizations at the outset is a combination of WPA and the Office of Education. With $9,781,340 allotted to WPA and $15,000,000 voted to the Education Office by Congress, enrollment of 150,000 men has been started, for short-term training in 600 of the nation's vocational schools. Fifty thousand of the men will be taken from WPA rolls, and the balance selected by State and federal employment services. Classes are being held in July, August and September.

U. S. Government Contracts Awarded to Metal-Working Firms

(Other Metal-Working Contracts on Page 548c)

Contractor	Gov't Agency	Commodity	Amount
Babcock Printing Press Corp., New London, Conn.	Ordnance	Machined shell	$183,131
National Tube Co., Washington, D. C.	Navy	Steel flasks	57,690
Boston Wire Stitcher Co., East Greenwich, R. I.	Engineer Corps	Wire staples	38,250
American Forge Division of The American Brake	Ordnance	Forgings for shell	70,235
Lundquist Tool & Mfg. Co., Worcester, Mass.	Ordnance	Telescope mounts	105,710
Fort Pitt Bedding Co., Pittsburgh, Pa.	Ordnance	Metallic belt links	419,260
York Safe & Lock Co., York, Pa.	Ordnance	Gun carriages	829,500
Saginaw Steering Division General Motors Corp., Detroit, Mich.	Ordnance	Machine guns	726,004
Norris Stamping and Manufacturing Co., Los Angeles, Calif.	Navy	Cartridge containers	333,728
Midvale Co., Washington, D. C.	Navy	Steel forgings	245,537
Midvale Co., Philadelphia, Pa.			
Bethlehem Steel Co., Bethlehem, Pa.	Navy	Steel forgings	210,000
Vega Airplane Co., Burbank, Calif.	Air Corps	Trainer assemblies	63,350
Carpenter Steel Co., Reading, Pa.	Ordnance	Steel rods	61,528
Crucible Steel Co. of America, New York, N. Y.	Ordnance	Steel rods	62,002
Pennsylvania Forge Corp., Philadelphia, Pa.	Ordnance	Steel forgings	107,016

MORE MACHINERY FOR LYCOMING

DETROIT — Aviation Manufacturing Corporation will spend $1,400,000 for machinery and equipment for its Lycoming Division which manufactures aircraft engines. An additional $300,000 is to be expended for machinery for production of hubs and propellors. The company has large U. S. orders.

Hillman May Appoint Understudy As CIO-AFL Disputes Continue

DETROIT—Continuing jurisdictional disputes between the UAW-CIO and the AFL crafts unions may force Sidney Hillman, government Employment Policies Coordinator, to appoint a regional understudy for this area, and for other industrial centers. An official with governmental authority is needed here to standardize relationships between the two unions and to prevent production blocks arising out of such disputes. Observers indicate it is unnecessary and time wasting to ask Washington for a ruling on every detail, which although minor compared to national labor problems, is important to the local auto industry during the changeover season when every day lost is extremely costly.

The need for such a step was forcibly brought again to the fore on July 3 when a jurisdictional fight developed in a local body plant over which union should handle the job of moving heavy presses. Probably out of fear that granting permission for AFL craftsmen to do the job might prove a foothold to the rival union, the CIO local refused AFL participation. Actually the CIO does not possess millwrights, machine foundation men, and specialized welders. Skilled men in these categories belong to AFL craft unions and are only needed temporarily. AFL teamsters countered the CIO by threatening to discontinue shipments into and out of the plant. Thus a plant employing thousands of men could have been tied up because of inter-union friction over a minor matter. With UAW-CIO national officers inclined to temporize because of the power of local unions, the situation needs clarification by men of the stamp and authority of Hillman.

Doubtless Hillman will issue instructions from Washington to impose more discretion on the future actions of the UAW-CIO and the local AFL group, especially where model changeover programs will be jeopardized. To prevent similar occurrences in the future, particularly when armament orders are placed, it may be well to have a local labor administrator who has the power and vision to standardize inter-union relationships and to prevent production blocks.

INSIDE DETROIT

Car shortage threatens as public unleashes buying power in fear of rising prices. Boosts are inevitable because labor and materials have risen several per cent in year

BY RUPERT LE GRAND, DETROIT EDITOR

DETROIT—Automobile manufacturers consistently lowered prices and increased values during 1938, 1939 and 1940 through direct reductions in list prices and by throwing in accessory items previously considered extras. But recent increases in material and labor costs plus higher taxes will undoubtedly reverse the recent trend. There is reason to believe that 1941 models may carry price tags asking at least $25–$30 more for lower-priced models, with proportionately greater increases applied to higher-priced lines.

Packard and Hudson raised prices of current models following imposition of the new federal excise tax of one-half of one per cent. In the latter case, the boosts of $14–$40 apparently seeks some compensation for higher manufacturing costs as well as prepayment of the new federal levy.

Several important elements of cost have advanced during the past twelve months. The rise in cost of raw materials is aptly illustrated by the average cost for 3,550 lb. of a score or more basic materials required to fabricate a low-priced sedan. In 1939 the average cost of these materials was approximately $135. But in 1940 the average cost has risen to $140. This $5 gain is conservative for figuring future commitments because of the wide fluctuations that occur monthly in various materials. For example, the low point for these materials was $135 in April, the high point was $143 in June, and the July figure fell to the average of $140, principally because of sharp declines in rubber, copper and wool prices. Yet all three materials might advance sharply.

Labor costs have advanced. A year ago the average wage paid in the automobile and parts manufacturing industries was approximately 90 cents. Today it is 94 cents. It has been suggested from a reliable source that the number of hours actually expended per car is approximately 250, neglecting the rubber, glass and textile industries. Therefore, it is apparent that labor costs have advanced at least $10 per car.

The Federal Trade Commission reported that the average profit per car was approximately $29. Obviously increases in wages and material costs have eaten seriously into the profit expectations of lower-volume producers, despite the upturn in sales during the past year. Competitive positions, as well as cost sheets, have a hand in setting car prices, but any general increase in prices will be a boon to the independents. Doubtless, manufacturers know the approximate new prices, but a final decision is not usually made until within a few days before announcement time.

Sales Gains Continue

Sales of new and used passenger cars to domestic consumers took a contra-seasonal upward turn in June, which bids fair to continue through July. Early returns for the first ten days of this month show that new records are being established for the summer season. For example, Pontiac had the best first ten days in July for any similar period back to 1928. It sold 6,643 units as compared with 3,341 a year ago, or practically a 100 per cent gain. Chevrolet disposed of 27,869 new cars and trucks, exceeding the first ten days of June, and surpassing the first ten days of July, 1939, by 50.6 per cent. This is considered a remarkable showing in view of 102,615 new car and truck sales in June.

Reports like these are mighty cheering to sales executives. Definite figures of new-car shortages are withheld, but there are indications that some factories could have built a few thousand extra units. Field stocks in the hands of dealers serving closed factories are such that only a month's supply remains. Thus, some dealers and certain sections may lack cars before public appearance of new lines, and must devote their attention to remaining used car stocks. It is probable that showrooms will actually be opened to the public in advance of scheduled announcements.

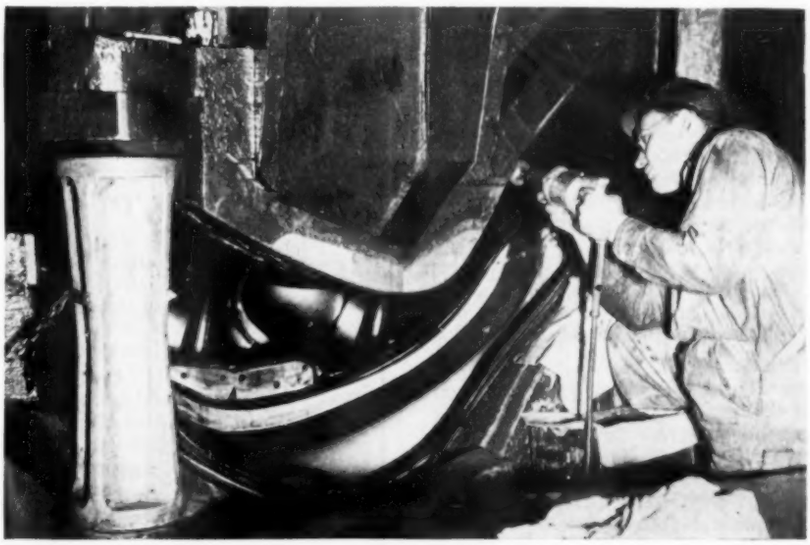
Used-car sales are doing well. Pontiac sold 13,174 units in the first ten days of July and had only 40,238 in dealer stocks. Chevrolet disposals reached 44,227 units, to attain the second highest total for the period in this division's history. Used-car inventories are normal or less than normal.

Chevrolet Gains

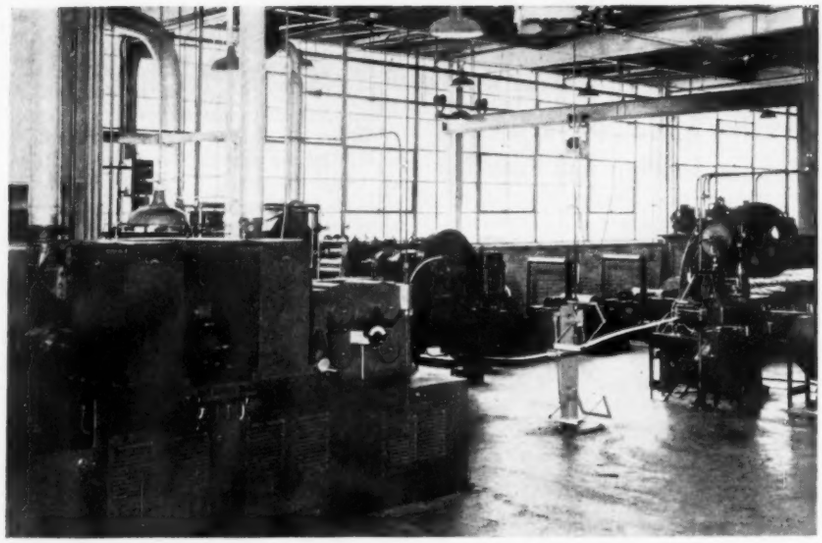
Production of the 1,000,000th current-model Chevrolet on July 12 discloses that this maker's output is 25

HUGE MUNITIONS CAPACITY

DETROIT—Fear that automobile makers may get so involved in munitions manufacture that they won't be able to meet the demand for motor cars is ill-founded. The truth is that the industry has enough plant capacity to turn out 5,000,000 cars a year and still produce large quantities of ordnance material. And the trick of getting the manpower isn't too hard.



Safety Blocks—*Because safety blocks made of Downmetal, industry's lightest structural metal, provide an additional safety precaution in die openings of sheet metal forming processes with men at work, they have been meeting with increased favor among machine operators*



Bearings from Strip—*After fusing metal powders to a steel backing strip and flowing high-lead babbitt into the sintered matrix, Moraine Products mills the strip thickness and stamps out blanks for new-type Buick engine bearings. Life of the bearing is claimed to be doubled*

per cent ahead of what it was on the same date a year ago. The figure then was 798,343.

It is likely that Chevrolet will produce in excess of 100,000 additional units before the anticipated model changeover during the middle of August.

Several years have passed since any maker has topped 1,000,000 units, which makes the relative sales position of Chevrolet, Ford and Plymouth of interest. Estimates are for through May.

"Big Three" Sales Positions

(Per Cent of Price Class Market)

	1940	1939
Chevrolet	43.5	41.0
Ford	28.1	31.0
Plymouth	22.4	25.0
Others	6.0	1.0

It is obvious that the gains made by independents have been at the expense of Ford and Plymouth. In the automobile industry, it is generally considered that an up or down swing of one or two per cent in the low-priced volume market is the result of a fierce competitive struggle.

Educational Order for Saginaw

Production of 500 machine guns at the Saginaw Steering Gear Division of General Motors can hardly get under way before October. Equipment valued at approximately one-fourth of the contract price had to be purchased. Orders went out about the first part of July. It is reported that the government desires to obtain 250,000 machine guns eventually. Very likely, Saginaw's success with this educational order, and its experience in small-parts manufacture generally, will prove a factor when quantity contracts are let.

The fact that Saginaw allotted one-fourth of the contract price to new machinery and tooling is unusual with educational orders. In many instances, the smallness of the contract has prevented setting up the type of tooling actually needed for large-scale manufacture and buying up-to-date machinery. In too many cases, contractors have been forced to do with idle equipment or to divert equipment to the government contract for a short period. Tooling, which is the essence of the scheme, has not ordinarily been developed to a high point of efficiency or productivity.

New Bearing for Buick

Buick's 1941 models will be equipped with a new-type high-lead babbitt precision bearing, said to show an increase in engine bearing life of over 200 per cent. Developed cooperatively with Moraine Products Division of General Motors, "Durex 100" main bearings involve application of powder metallurgy. A matrix of pure copper and nickel powders is deposited upon straightened strip-steel backing material. The coated strip enters a four-stage electric furnace where the matrix is permanently bonded to the steel by sintering. The strips are then recoiled.

During intermediate processing, the matrix-coated strip is again straightened and welded automatically for continuous feeding through a tunnel-type vacuum machine wherein babbitt is flowed over the matrix in three stages. The vacuum exhausts air from pores in the matrix, permitting the babbitt to fill the sponge-like structure completely. In the fourth stage, the thickness of the babbitt is held to a close limit.

In a third processing line, the babbitt is milled to thickness by down-cutting and climb-cutting, leaving 0.005–0.010 in. for final finishing. The milled strip passes directly to a press for shearing retangular blanks to form bearing half-shells. Blanks are transferred to a machine shop for forming, sizing and finishing prior to shipment to Buick.

Buick's new bearing is made to withstand operation with high compression ratios, permitting the new models to take advantage of economy and performance expected from the new high-octane fuels to be available this fall. The thin layer of babbitt used in Durex 100 bearings will prevent, it is said, the formation of incipient fatigue cracks, and was made possible by development of the new method of bonding a hard matrix to a steel backing shell. It is reported that the new bearing completely meets the requirements laid down five years ago for the "ideal" bearing by A. F. Underwood, head of the mechanical engineering department, General Motors Research Laboratories, and now achieved for the first time.

FORD SIX FOR '41

DETROIT—All signs point to a new Ford six about the first of the year. The OMA model, scrapped months ago, has given way to the 1G, which is designed apparently along conventional lines. At least the overhead camshaft on the OMA has been given up. To go with the new engine, Ford will probably have a body built along somewhat radical lines, especially in matters of weight saving and frame construction. The butt-welded frame may utilize rather unusual cross-sections, made possible by exceptionally accurate control of press-shop operations.

Large Airplane Factory Shift Made by Hall Aircraft Corp.

The first sizable shift of an aircraft factory away from the coast is scheduled soon, for the Hall-Aluminum Aircraft Corp. will close its Bristol, Pa., plant and establish a $5,000,000 airplane factory at Dallas, Texas, to build bombers and pursuit ships for the U. S. Army.

Dallas Chamber of Commerce officials indicate that executives, technical directors, and minor employees will be transferred from the east. The new plant will employ 5,000 men and have a monthly payroll between $750,000 and $1,000,000, and will be the largest industrial establishment in Texas.

WATCHING WASHINGTON

Machinery for national defense swings into action as increasing amount of red tape is cut. Question of profits holds spotlight. Amortization of new plant capacity remains a major problem

BY BLAINE STUBBLEFIELD

WASHINGTON—The national defense machine still is chugging along in low gear. It won't be long, however, until it will shift into second if not into high. Red tape is being cut to speed things up. But obviously contracts cannot be placed until the money is available, and the biggest Army appropriation of all, totaling around four billion dollars, is yet to go through Congress. And Congress has served notice that it doesn't intend to be rushed off its feet again by pressure to jam through defense money overnight without adequate hearings.

One of the factors tending to hold the defense machine back is the lack of legislation to clarify amortization rates on new plant capacity constructed solely for defense purposes. The White House has indicated that five years is an acceptable amortization period, with half the debt to be written off the first two years. But the bill making such action legal hasn't yet been introduced in Congress, let alone passed. The Treasury, adamant against any concessions to industry, hasn't changed its mind but has been forced into line by Mr. Roosevelt, according to reliable reports.

It would be a mistake to get the idea that speed isn't being shown. As an example: one government department with equipment orders running well into the millions and including hundreds of items for the fiscal year 1941 expects to have all the work under contract by October 1 or shortly thereafter. That is in sharp contrast with the 1940 performance when awards were still being made almost up to the end of the fiscal year.

And don't worry too much about government operation of plants which would have other than a wartime use. True, the TVA crowd is itching to make their organization a spearhead for government ownership and management of industries connected with defense activities. But Army and Navy officials are opposed to such shenanigans, saying that government operation will go through only over their dead bodies. Army people are well aware of the fact that short hours, long vacations, sick leave and the general lowered efficiency which seems to go with government operation would slow down the defense program if the government insisted upon running manufacture instead of private industry's doing the job.

Governmental arsenals and Navy yards now have tough time enough trying to compete for labor against private industry. An arsenal, for instance, is permitted to pay the going wage in its local community. In order to change the rate, the commanding officer must secure authority from Washington, proving that the rate has risen. By the time the approval is secured, the rate paid by private industry has gone still higher. The government doesn't move fast enough to keep up with private industry. That puts the arsenal officers constantly behind the labor eight ball.

Paper Plane Program

A 25,000-plane aircraft program has been completed—on paper—the defense commission says. George Mead, Knudsen's aircraft specialist, has worked out with Army, Navy, and the British a plan to standardize on existing types. What types have been standardized on is supposed to be a military secret, but it's understood that the plan means essentially that we will continue to build the planes we are building now, turning them out in quantity without changing the specifications every third unit.

FEWER DRAFT EXEMPTIONS

WASHINGTON — The proposed Selective-Service Act being debated by Congress calls for a much stricter interpretation than the plan used in the World War. Fewer lines will be classified as essential industries this time. For example, a man will not be exempted because he is a riveter in a shipyard. He will be enrolled and assigned to the job, if it is proved that he is essential. Ordinary physical disabilities, such as poor eyesight, underweight, flat feet and minor handicaps, will not exempt men. They will be listed and assigned to their present or other duties as best fits the case. Non-essential industries will be given time to replace employees selected by local boards for service. The period allowed will vary.

A start has been made on the next step of allocating production among manufacturers. On the 4,700 combat ships and 3,900 trainers already appropriated for, contracts are about ready to award as soon as Congress straightens out the amortization tangle, and negotiations are already under way on the 19,000 additional ships the President has asked Congress to buy.

Fight Over Profits

On no aspect of the defense program has there been more confusion and vacillation than on profit restrictions and the companion problem of amortization of expanded plant. At present the question is wide open until Congress re-examines it, and contractors and contracting officers are all at sea.

For the past several years profit limits, of 10 and 12 percent respectively, have been imposed on builders of ships and airplanes. Regular plant facilities used in executing the contracts have been amortized in normal fashion, while special facilities only of value for the particular contract could be charged as a cost in computing profits. Determination of which class a given item fell into was done by the Treasury, and manufacturers (and Army and Navy officers) complained that the Treasury was unduly strict.

Last month, when Congress passed the bills expediting defense (AM, July 10, p. 514e) it continued this system but reduced allowable profits to 8%, while putting amortization determinations in the hands of Army and Navy. The affected industries let out a howl, and contract negotiations promptly bogged down in fiscal red tape.

Last straw was probably the Packard directors' qualms about taking the Rolls Royce contract. At any rate Treasury, Army, Navy, and Congressional leaders got together this month and came out with an announcement that the war profits tax legislation soon to be presented to Congress would absorb the Vinson-Tramel regulations in a general profit limit affecting all industries rather than just two. Amortization of defense-expanded plant, moreover would be put on a liberalized basis with a term, probably of five years.

This meant that the accounting machinery already set up was obsolete. Until Congress acts on the tax law no one can know how much profit he will be allowed or what items he can consider as a cost in computing the amount of his contract and his profits.

H. Disston & Sons, Saw Makers, Celebrate 100th Anniversary

Henry Disston & Sons, Inc., Tacony, Philadelphia, Pa., is celebrating the 100th anniversary of the founding of the company. Although as a pioneer saw manufacturer in the United States, Disston's 65-acre plant has been geared to top production—5,000,000 saws and blades a year—to fill government orders in the national defense program, company officials have planned tribute to the memory of Founder Henry Disston.

Henry Disston was 21 years old when he founded the business in the basement of his Philadelphia home at a time when most saws were being imported from England. Today the organization produces 2,000 products which are sold in 68 different countries. In addition the company maintains branches in Toronto, Canada; Sydney, Australia; and Seattle, Washington.

Greetings—*Former associate, 83-year old Luke Fraser, center, is being welcomed by president Henry Disston, right as vice-president J. Disston, Jr., looks on. Mr. Fraser took part in the celebration*

The officers of the company are: S. Horace Disston, president; W. D. Disston, vice-president; and Jacob S. Disston, vice-president. William L. Disston, Jr., the first of the fourth generation of the Henry Disston family, is being trained in the shops.

TOOL ENGINEERS JOIN A.S.A.

NEW YORK—The American Society of Tool Engineers has become a Member-Body of the American Standards Association and will be represented on the Standards Council and Mechanical Standards Committee.

Since the tool engineer is the man responsible for the production of ideas conceived by designers, he is particularly interested in the national standardization program.

U. S. Government Contracts Awarded to Metal-Working Industry in 1940-1941

Contractor	Govt. Agency	Commodity	Amount
Standard Pressed Steel Co., Jenkintown, Pa.	Ordnance	Ammunition parts	$15,760
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn	Ordnance	Fire control instruments	200,711
Lundquist Tool & Mfg. Co., Worcester, Mass	Ordnance	Fire control instruments	50,450
International Harvester Co., Chicago, Ill	Ordnance	Heavy tractors	2,272,500
Allis-Chalmers Mfg. Co., Milwaukee, Wis	Ordnance	Heavy tractors	497,277
United Shoe Machinery Co., Boston, Mass	Ordnance	Guns	1,316,200
Remington Arms Co., Inc., Bridgeport, Conn	Ordnance	Cartridges	690,775
Gilbert and Barker Mfg. Co., Springfield, Mass	Ordnance	Fire control instruments	721,594
Eastman Kodak Co., Rochester, N. Y.	Ordnance	Fire control instruments	250,382
Lundquist Tool & Mfg. Co., Worcester, Mass	Ordnance	Fire control instruments	50,450
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn	Ordnance	Fire control instruments	208,007
Bendix Aviation Corp., Eclipse Aviation Div., Bendix, N. J	Ordnance	Fire control instruments	1,013,955
Bausch and Lomb Optical Co., Rochester, N. Y	Ordnance	Fire control instruments	405,359
Koppers Co., Bartlett Hayward Div., Baltimore, Md	Ordnance	Gun carriages	3,724,930
Aetna-Standard Engineering Co., Youngstown, Ohio	Ordnance	Gun carriages	3,302,139
General Electric Co	Ordnance	Howitzers, pack	554,584
National Pneumatic Co., Rahway, N. J	Ordnance	Guns	1,397,458
The Warner & Swasey Co., Cleveland, Ohio	Ordnance	Lathe, turret, universal	21,043
York Safe & Lock Company, York, Pa	Ordnance	Gun mounts	1,324,062
Standard Pressed Steel Co., Jenkintown, Pa	Ordnance	Cores for bullet	304,800
Russakov Can Company, Chicago, Ill	Ordnance	Ammunition	117,300
Bridgeport Thermostat Co., Inc., Bridgeport, Conn	Ordnance	Ammunition	118,167
Karp Metal Prods. Co., Inc., Brooklyn, N. Y.	Ordnance	Radio cabinets	206,010
James Cunningham, Son & Co., Rochester, N. Y	Ordnance	Machine gun assemblies	215,180
Universal Crusher Company, Cedar Rapids, Iowa	Ordnance	Machine gun assemblies	92,400
Stewart-Warner Corp., Chicago, Ill	Ordnance	Fuze units	222,625
Pollak Mfg. Co., Arlington, Va	Ordnance	Fuze units	349,760
Fort Pitt Bedding Co., Pittsburgh, Pa	Ordnance	Links	366,800
Keuffel & Esser Co., Hoboken, N. J	Ordnance	Elbow telescopes	32,768
Bendix Aviation Corp., Marine Division, Brooklyn, N. Y	Ordnance	Fire control instruments	75,046
Steuart Motor Co., Washington, D. C	Ordnance	70 Trucks	60,868 9,116
Yellow Truck & Coach Mfg. Co., Pontiac, Mich	Ordnance	Trucks	81,537
Fargo Motor Corp., Detroit, Michigan	Ordnance	1182 Trucks	899,715
Marmon-Herrington Company, Inc., Indianapolis, Ind	Ordnance	24 Trucks	99,678
The Corbitt Co., Henderson, N. C	Ordnance	22 Trailers	30,424
Fairchild Aviation Corp., Jamaica, N. Y	Air Corps	Aircraft cameras	468,757
Yale & Towne Mfg. Co., Stamford, Conn	Air Corps	Fuel pumps	122,629
General Bronze Corp., Long Island City, N. Y	Air Corps	Propeller dolly assemblies	54,652
Biderman Motors Corp., Cincinnati, Ohio	Air Corps	Truck-tractors	125,482
The Trailer Co. of America, Cincinnati, Ohio	Air Corps	Truck-tractors	40,780
Pioneer Instrument Div., Bendix, N. J	Air Corps	Drift meters	50,000
Bendix Aviation Corp., South Bend, Ind	Air Corps	Wheels and brakes	41,454
Eclipse Aviation Div., Bendix, N. J	Air Corps	Starter assemblies	620,549
The Heald Machine Co., Worcester, Mass	Air Corps	Cylinder grinder	59,280
The Variety Aircraft Corp., Dayton, Ohio	Air Corps	Maintenance assemblies	266,250
The Seifreat-Elstad Machinery Co., Dayton, Ohio	Air Corps	Honing machines	258,632
Pratt & Whitney, West Hartford, Conn	Air Corps	Lathes	87,995
Sperry Gyroscope Co., Inc., Brookiyn, N. Y.	Air Corps	Parts for automatic pilots	49,200
The Heil Co., Milwaukee, Wisconsin	Air Corps	Trailers and dollies	209,675
Air Associates, Inc., Garden City, N. Y	Air Corps	Airplane mooring kits	25,730
Hamilton Standard Propellers, East Hartford, Conn	Air Corps	Propeller assemblies	198,055
Fairchild Aviation Corp., Jamaica, N. Y	Air Corps	Cameras	233,028
Hayes Industries, Inc., Jackson, Mich	Air Corps	Wheel and brake assemblies	227,737
The Plomb Tool Co., Los Angeles, Calif	Air Corps	Tools and equipment	31,427
Curtiss Propeller Div., Clifton, N. J	Air Corps	Propeller assemblies	429,400
Holtzer Cabot Elec. Co., Boston, Mass	Signal Corps	Telephones and parts	537,750
Leach Company, Oshkosh, Wis	Signal Corps	Reel Units	378,150
The Dicke Tool Co., Inc., Downers Grove, Ill	Signal Corps	Reel Units	114,583
Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y	Signal Corps	Switchboards	399,966
Sperry Gyroscope Co., Brooklyn, N. Y	Engineer Corps	Searchlight units	821,679
American Car & Foundry Co., New York, N. Y	Engineer Corps	Tank cars	193,231
Bausch & Lomb Optical Co., Rochester, N. Y	Engineer Corps	Mapping equipment	32,837
General Electric Co	Engineer Corps	Searchlights	49,782
Fate Root Heath Co., Plymouth, Ohio	Engineer Corps	Locomotives	51,502
International Stacey Corp., Columbus, Ohio	Engineer Corps	Searchlight towers	20,940

$100,000,000 ARMS EXPORTED

WASHINGTON—From the State Department comes the announcement that a total of $100,063,870.68 worth of arms, ammunition, and implements of war have been exported from the United States during the year 1940, including May. The largest buyer of war materials was France with $53,712,110.50; Great Britain was second with $13,335,081.15; Australia was third with $8,472,739.62. Other heavy buyers were: Finland, $5,096,837; Canada, $2,657,524; China, $2,421,758; Netherlands East Indies, $2,349,644; and Turkey, $1,705,800.

NAMES in the NEWS

J. Carlton Ward, Jr., has been elected president of Fairchild Engine & Airplane Corp. Until recently, Mr. Ward was vice-president of United Aircraft Corp. and general manager of its Pratt & Whitney Div., posts which he has held since November, 1938. Sherman Fairchild, former president, resigned to become chairman of the board.

Charles H. Chatfield, director of research of United Aircraft Corp., East Hartford, Conn., since 1935, has been appointed executive assistant to the vice-president. Succeeding Mr. Chatfield as director of research is Frank W. Caldwell who, since 1935, has been engineering manager with the Hamilton Standard Propellers Div. At the same time, Earle Martin, formerly chief engineer of the Hamilton Standard Propellers Div., has been appointed engineering manager to succeed Mr. Caldwell.

New appointments at the Vought-Sikorsky Aircraft Div. in Stamford, see Joseph M. Barr as factory manager, and James J. Gaffney as assistant treasurer and division accountant. The latter succeeds E. H. Glaettli who will continue as an assistant secretary. William R. Robbins, now assistant general accountant of United Aircraft Corp., will succeed Mr. Gaffney as assistant treasurer and assistant secretary of the Pratt & Whitney Aircraft Div.

J. E. Stanton, associated with the Republic Steel Corp. since 1912, has been appointed assistant to the president of the Aviation Mfg. Corp.

W. C. Morgenstern has been appointed assistant chief engineer at Copperweld Steel Company's new plant at Warren, Ohio.

John H. Alfes, who 21 years ago began his career in the engineering and production end of the automobile industry, has been appointed chief inspector of Olds Motor Works to succeed K. C. Plasterer, who will handle special assignments in the future.

John M. Price, for the past five years vice-president of Ferro Machine & Foundry Co., an affiliate of Oglebay, Norton & Co., was elected president by the board of directors. Henry B. Myers, factory manager for the company during the last six years, was elected second vice-president. Mr. Price succeeds the late James S. Leitch.

John F. Lebor, recently with the RKO Corp., has been appointed assistant to the executive vice-president of the York Ice Machinery Corp., York, Pa.

Heads Fairchild

J. CARLTON WARD, JR.

Advanced by United Aircraft

FRANK W. CALDWELL

CHARLES H. CHATFIELD

William W. Barnes, manager at Philadelphia of Air Reduction Sales Corp., has retired after 30 years of active work in the industry.

W. Leslie Lawrence has been elected secretary of the Alexander Milburn Co., Baltimore, Md. Mr. Lawrence, who became one of the company's directors a short time ago, succeeds the late Mr. Harvey H. Johnson.

PLANT EXPANSION

Edo Aircraft Corp., College Point, N. Y., will build immediately a $125,000 addition to its plant. This will increase the firm's space for manufacture of pontoons for sea planes from 20,000 to 40,000 sq. ft.

Curtiss-Wright Corp. will erect a new plant for the manufacture of airplane propellers at Caldwell, N. J. The new plant, which is scheduled to be completed by September, will be a one-story steel and brick structure with 230,000 sq. ft. of floor area, and the new unit will make the Curtiss Division one of the world's largest manufacturers of aircraft propellers.

Warner & Swasey Co., Cleveland, Ohio, manufacturer of turret lathes, has just completed a new addition to their plant.

U. S. Spring & Bumper Co., 4951 Magnolia St., Los Angeles, Calif., is building a new addition to its factory. The expansion will cover an area of 75 x 240 ft. and will cost $18,000.

Air Transport Mfg. Co., Los Angeles, Calif., will erect a new aircraft factory building at Dougherty Field, Long Beach, Calif. The extension will cover an area of 30,000 sq. ft., and will cost approximately $65,000.

George Gorton Machine Co., Racine, Wis., has completed a 12,000-sq.ft. factory addition to house its assembly and shipping departments.

SKF Industries, Inc., Philadelphia, Pa., is planning construction of a 226,000-sq.ft. plant to be devoted exclusively to the manufacture of anti-friction bearings.

Cleveland Punch & Shear Works Co., Cleveland, Ohio, has boosted its production capacity by 50 per cent with equipment now installed in the 34,000-sq.ft. addition which added 25 per cent to its floor space.

Micromatic Hone Corp., Detroit, Mich., has moved its entire organization into larger quarters. Expansion represents an increase of approximately 75 per cent in employees and over 100 per cent in space occupied during the last 18 months.

Huebsch Mfg. Co., Milwaukee, Wis., has purchased the General Bronze Corp. plant, which will more than double the company's factory space.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., is putting into operation what is claimed to be the world's most modern plant for the production of coated rods for electric welding. The plant will have a capacity about four times as great as the previous output level.

Lockheed Aircraft Corp., Los Angeles, Calif., is planning a $4,000,000 expansion program which will more than double its present facilities.

Douglas Aircraft Co., Santa Monica, Calif., is planning a $2,000,000 plant expansion program.

Brewster Aeronautical Corp., Long Island City, N. Y., has more than doubled its total floor space by leasing the assembly plant of the Ford Motor Co. of that city.

SALES

J. R. Kumer, Jr., has been appointed manager of stainless bar and wire sales for Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Truman B. Brown has been made manager of Ludlite sales, with headquarters at Watervliet, N. Y., while Louis F. Lippert has been appointed manager of Pluramelt sales, with headquarters in Pittsburgh.

D. J. Henecker and C. E. Kendall have been appointed assistant managers of wire products sales for Jones & Laughlin Steel Corp., Pittsburgh, Pa. Mr. Henecker will be in charge of wire rope sales, while Mr. Kendall will head sales of wire and galvanized sheets. Consolidation of the company's wire rope sales division with its wire products division, under J. E. Timberlake, present manager of wire products sales, has been effected.

Thorvald L. Haines has been appointed Chicago district manager for William Jessop & Sons, Inc., New York, N. Y.

A. I. Richardson has been appointed Dallas, Tex., manager for Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Fred L. Lawrence has been appointed Detroit district manager for Copperweld Steel Co., Warren, Ohio.

George W. Person, sales engineering department of the Norton Co., Worcester, Mass., has been transferred to St. Louis for special grinding wheel field service. J. L. de Vou, Jr., and George L. Freeman have been appointed field engineers of the Cleveland and Chicago districts respectively.

E. H. Anchors has been appointed Oklahoma City district sales manager for Air Reduction Sales Co., New York, N. Y.

G. B. Flanigan has been appointed New York district manager for Chain Belt Co., Milwaukee, Wis. He succeeds W. H. Quinn, who died recently after seventeen years association with the company.

George Campbell has been appointed manager of the Buffalo, N. Y., office of General Electric Co., Schenectady, N. Y. He succeeds George H. Calkins, who has retired after 41 years of service with the company. Ralph M. Darrin has been named manager of the Syracuse office, E. H. Aussicker has been made manager of the Schenectady office, and E. B. Currie has been named manager of the Binghamton office.

T. E. Cook has been appointed Chicago, Ill., sales representative for Jessop Steel Co., Washington, Pa. J. W. Stranahan has been appointed to the Cleveland, Ohio, district. C. E. Spragg, formerly in the New York office, has been transferred to Hartford, Conn.

R. T. Steindorf has been appointed Chicago district manager for Chain Belt Co., Milwaukee, Wis.

R. J. Steindorf has been appointed district manager of the Chicago office of Chain Belt, Milwaukee, Wis. Mr. Steindorf has been associated with the company since his graduation from college in 1924.

L. W. Sloan, 408 Olive St., St. Louis, Mo., has been appointed district sales representative in St. Louis, Missouri, and vicinity for the complete line of Trico Fuse Mfg. Co., Milwaukee, Wis.

BUSINESS ITEMS

Allmetal Aircraft Co., Inc., has been organized in Los Angeles, Calif., with a capital of $500,000. Miller, Peck & Miller, 222 Grosse Bldg., Los Angeles, will represent the new corporation.

Corsby Aircraft Corp. has been formed in Los Angeles, Calif., with a capital of $100,444. Orville A. Rogers will represent the new corporation at 1212 Commercial Exchange Bldg., Los Angeles, Calif.

With a capital of $1,500,000 National Aviation, Inc., has been organized in Los Angeles, Calif. Directors are: Leon Kaplan, M. H. Livingston and E. Burger, all of Los Angeles. The new corporation will be represented by Kaplan & Kaplan, 6253 Hollywood Bldg., Los Angeles, Calif.

Van Norman Machine Tool Co., Springfield, Mass., has purchased the Metal Saw & Machine Co., also of Springfield. The band saw business of the new acquisition has been sold to the L. S. Starrett Co., Athol, Mass.

R. S. Stokvis & Sons, Inc., New York, N. Y., are in a position to handle any accounts in the Netherland East Indies for companies which have lost contact with their foreign representatives because of war developments.

With a capital of $500,000, the Wesyn Aircraft Co., Inc., has been organized in Los Angeles, Calif. The new concern will be represented by William E. Gunason, 1010 Alvira St., Los Angeles, Calif.

Cutler-Hammer, Inc., Milwaukee, Wis., is moving its Pittsburgh, Pa., office to new and larger quarters at 355 Fifth Ave.

Michigan Tool Co., Detroit, Mich., has appointed C. Howard Eden, Los Angeles, Calif., to handle the Michigan line of gear finishing and lapping machines and "Sine-Line" checking equipment. D. E. Schellenbach, San Francisco, Calif., has been appointed representative for the northern half of California. In addition to machinery, Mr. Schellenbach will also handle the "Mitco" line of cutting tools.

Cowles Detergent Co., Cleveland, Ohio, has appointed James H. Rhodes & Co., Long Island City, N. Y., and Chicago, Ill., as distributor for its line of anhydrous metal cleaners.

Joslyn Mfg. & Supply Co., Chicago, Ill., electrical equipment manufacturer, has purchased the William E. Pratt Mfg. Co., Joliet, Ill., roller bearing manufacturer.

Hill Clutch Machine & Foundry Co., has purchased the assets of the Acme Machinery Co., both of Cleveland, Ohio, to form a new corporation, the Hill-Acme Company. Officers of the new company are: Ralph Perkins, chairman; A. C. McDaniel, president; Karl F. Bruch, vice-president; L. L. Hercik, vice-president and general manager; Milo G. Firestone, treasurer, and John R. Short, secretary. The combined annual business of these companies exceeds $2,000,000 and working capital will exceed $1,000,000. The Acme Machinery Co. will continue to operate as a division of the Hill-Acme Co., as will the Cleveland Knife and Forge Co., and the Canton Foundry & Machine Co.

MEETINGS

American Institute of Electrical Engineers. Pacific Coast convention, Los Angeles, Calif., Aug. 26-30.

National Foreign Trade Council. Twenty-seventh national foreign trade convention, San Francisco, Calif., July 29-31.

Porcelain Enamel Institute. Fifth annual forum, University of Illinois, Urbana, Ill., Oct. 16-18.

Silver Bay Conference on Industrial Relations. Twenty-third annual meeting, Silver Bay on Lake George, N. Y., July 24-27.

Society of Automotive Engineers. National tractor meeting, Schroeder Hotel, Milwaukee, Wis., Sept. 24 and 25. Annual dinner, Hotel Commodore, New York, N. Y., Oct. 14.

SHOP EQUIPMENT NEWS

Profiling Machine Made by National Holds Work to Close Tolerances

All that the operator has to do in running one of the new profiling machines announced by National Broach & Machine Co., 11457 Shoemaker St., Detroit, Mich., is to load and unload the two work fixtures. The machine is entirely automatic and holds finished work to a tolerance limit of 0.002 in. No mechanical skill is needed to operate the machine. The work performed in this machine is strictly a profiling operation, and is not to be confused with three-dimensional duplicating. Profiling is restricted to the milling of profiles, internal or external, flat or undercut, on parts having a profile pattern not larger than 6 x 8 x 2 in. thick, where the cut is ⅛ in. deep or less on a face ¾ in. wide or less.

The principal field of application for this "Red Ring" profiler lies in the manufacture of parts for small arms and artillery breech mechanisms, the duplication of all kinds of flat cams, the profiling of airplane pistons and connecting rods to reduce weight, the production of instrument parts, accurate machine parts, and electrical equipment parts.

The machine utilizes a closed differential hydraulic circuit to actuate its movement. This is claimed to assure freedom from chatter and to give greater responsiveness to directional changes of the guide pin. This system includes a hydraulic pump which actuates the pistons by drawing a measured amount of fluid from one side and transferring it to the other. A second pump maintains and regulates the amount of pressure in the system.

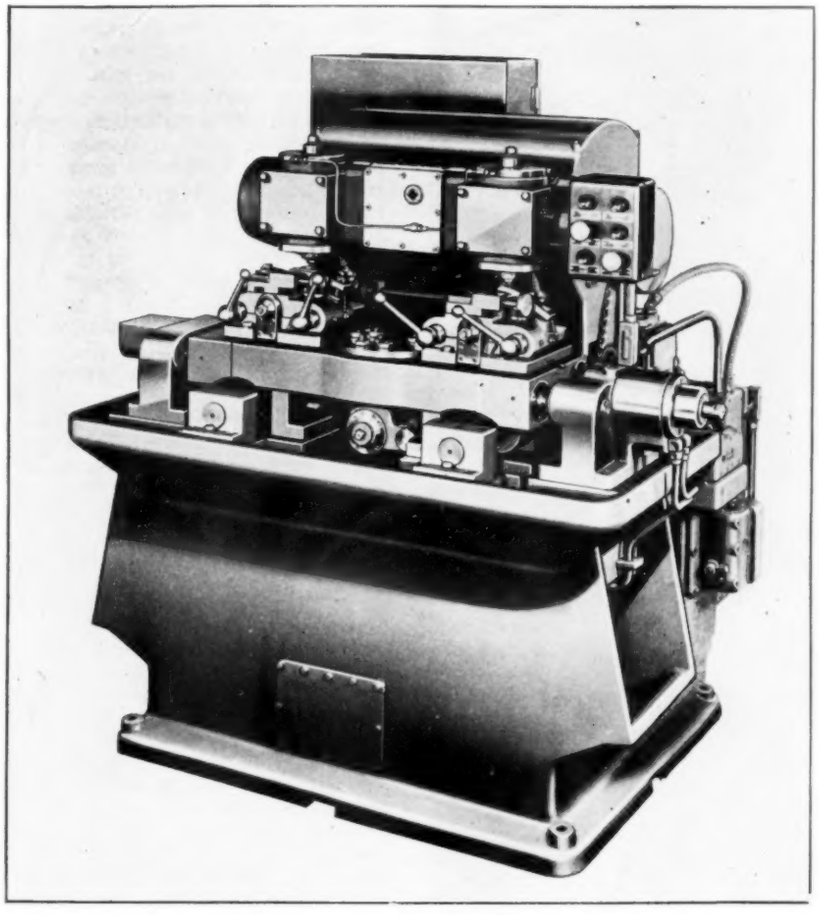
The work table which carries two work fixtures moves laterally. The spindle head of the machine, which carries two spindles, one for each work station, moves at a right angle to the direction of table movement. These two principal movements are both reversible, and each is actuated by its own hydraulic cylinder. When the spindle head cylinder is working under feeding pressure, the table cylinder is working under holding pressure and vice versa. Change from feeding pressure to holding pressure is obtained by dogs which operate limit switches.

A master pattern or cam the exact size and shape of the finished work part is mounted rigidly to the bottom of the work table. A guide pin integral with the spindle head extends upward under the table to contact the periphery of the master cam. Location of this mechanism beneath the table avoids errors caused by chips and dirt.

When the machine is put into motion the guide pin traces around the periphery of the master cam. Its motion is guided by maintaining the cam and guide pin in contact by means of changes from feeding pressure to holding pressure from point to point in its path as required by the shape of the pattern being profiled.

Cutter spindles are individually motor driven. Vertical adjustment is provided on the spindles to allow for slight variations in tool adjustment. The tapered guide pin is adjusted vertically by a graduated dial to compensate for cutter wear. Force feed lubrication is provided to all bearings and slides.

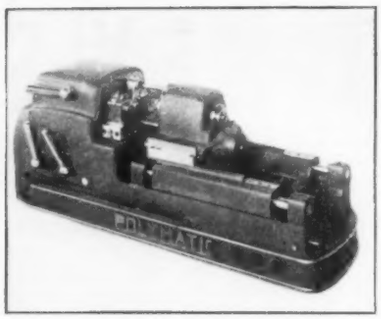
The work table carrying the holding fixtures and the master profile cam is of ample proportions to accommodate large fixtures. Keyways and T-slots are provided for locating these fixtures.



Unit "Polymatic" Former Makes Precision Parts

The "Polymatic" high speed wire forming and cut-off machine was developed by the Unit Machinery Co., Rockford, Ill., for the production of small precision screw machine parts. The following machining operations, or a combination of them, are obtainable: stock feed to fixed or swinging stop, forming and cut-off with two cross slide tools, and one or two end operations. These end operations may be threading, drilling, box turning, or turning with a swing tool and live pickup.

The machine shown is equipped with a live pickup spindle, which is geared to the main spindle. A collet in the spindle nose chucks the part

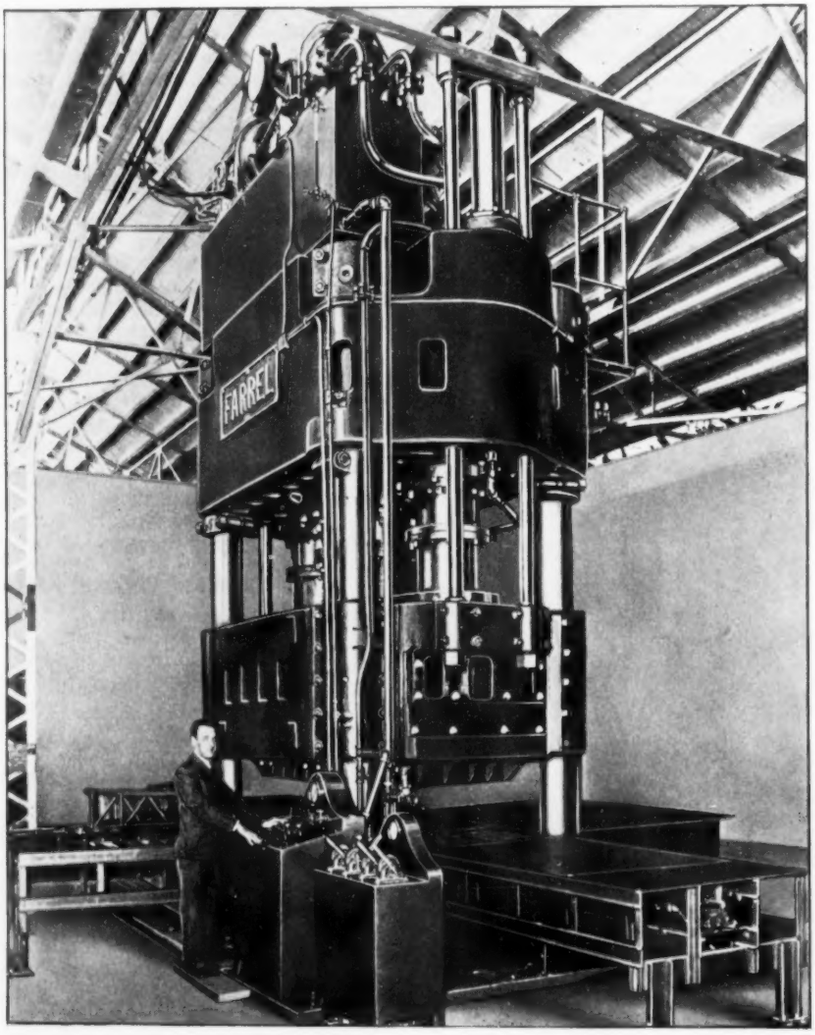


while being cut off and prevents the premature breaking off with a resultant burr. As the collet opens in the pickup spindle the part is pushed through a tube inside the spindle. The finished parts drop at the back end of the spindle, entirely separated from the chips.

Two models of this machine are available. The No. 01 handles wire stock to 5/32 in. diameter, and the No. 11 machine will take stock up to ¼ in. in diameter. Both sizes of the machine are available either self-contained on a cast iron base, or arranged for bench mounting. The machines are motor driven and have pickoff gears for spindle speed changes and feed changes. Spindle speeds of the smaller model range up to 15,000 r.p.m., while the larger model has a maximum speed of 10,000 r.p.m.

Farrel-Birmingham Hydraulic Press Forms Duralumin Aircraft Parts

A feature of a 2200-ton hydraulic press recently made for forming metal aircraft parts by Farrel-Birmingham Co., Inc., Ansonia, Conn., is the conveyor tables located on four sides of the press for loading and unloading purposes. These conveyors keep the press operating at maximum capacity. The tables each are equipped with a movable platen on which dies are mounted and carried into and out of the press. The platens are controlled from a main control desk alongside the press control desk.



Stroke of the conveyor cylinders is so arranged so that the platen registers uniformly on the press bolster. Construction of the conveyors is such that they can be removed readily in the event that large dies occupying the full length and width of the press are to be used.

The press weighs approximately 175 tons and stands nearly 26 ft. high. While the maximum capacity is 2200 tons under a hydraulic pressure of 2500 lb. per sq. in. on one 38-in. ram and two 20-in. rams, the pump control is designed so that a wide range of hydraulic pressures may be obtained by simple adjustment at the control panel. Two 10-in. diameter single-acting push-back rams raise the moving platen to the open position. Dimensions of the clear space available between tie rods are 61 in. wide and 97 in. long. Overall dimensions of the bottom crosshead and of the moving platen are 96 x 133 in. Both the moving platen and the bottom crosshead are provided with T-slots running the width of the press and with machined surfaces for future addition of platen extensions to make the platen area 96 x 178 in.

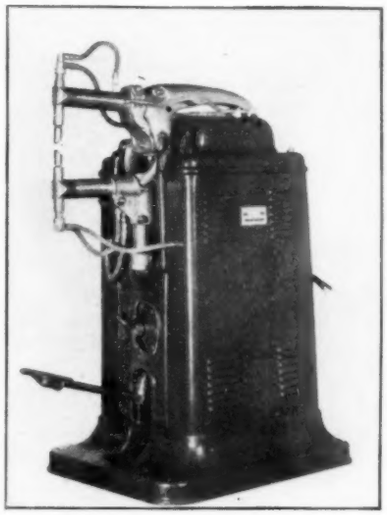
The press has a maximum opening of 60 in. and a maximum stroke of 36 in. Provision has been made to reduce the maximum opening to 38 in., maintaining the 36 in. stroke. Closing speed is variable from 1 to 130 in. per min., with a pressing speed of from 1 to 12 in. per min. The traverse or return speed is approximately 130 in. per min.

Power generating equipment, consisting of a motor-driven pump, valves, piping and oil storage tank, is mounted on top of the press. The hydraulic pressure pump is of the radial piston type, with variable pressure control, and is driven by a 150 hp., 900 r.p.m. motor. The entire control of the press is effected from a control station located near a corner of the press. This station has pushbuttons for starting the pump motor, increasing and decreasing downward travel speed, a manual control lever, electric control levers for automatic operation of the press, and a pushbutton to control the single cycle operation.

A.E.F. Standard Welders Made in Three Frame Sizes

A line of standardized spot welding machines available on three sizes of frames has been announced by American Electric Fusion Corp., 2610 Diversey Ave., Chicago, Ill. Interchangeable parts are used wherever possible on the three sizes of these machines. Each of the three frame sizes is sufficiently large to house either of two transformers. Thus, the Type BG welder with 10 kva. capacity, also houses the 15 kva.

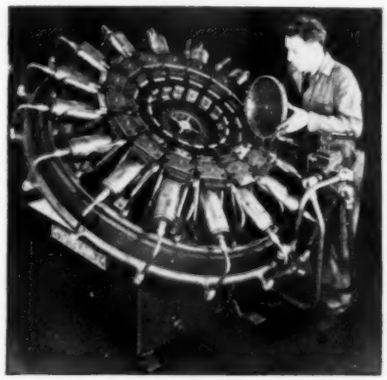
transformer of Type BH welder. The medium frame takes either the 20 kva. transformer of the Type BL welder, or the 30 kva. transformer of the Type BM welder. Similarly, the large frame machine has space for



the 40 kva. capacity transformer used in the Type BP welder, and the 50 kva. capacity for the Type BR welder. Horn lengths for various throat-depths are the only part of these welders to be added as orders are received. The most popular sizes of horn lengths are usually carried in stock so that shipment of these welders can be made promptly.

Progressive Punch Units Punch Sixteen Holes

High production speed, flexibility of individual punching units to permit rearrangement, elimination of cam dies, and constant air pressure method of piston return are features of a series of self-contained hydrau-

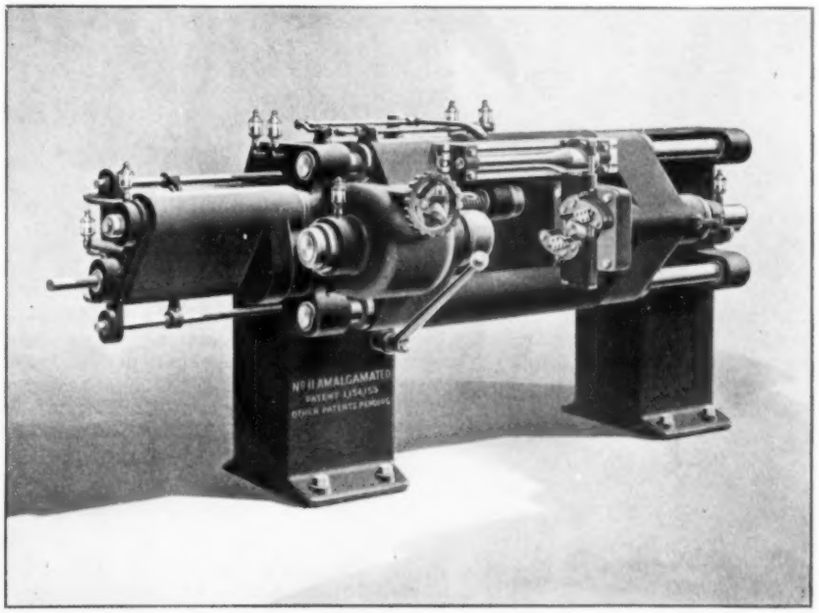


lic punching units, announced by Progressive Welder Co., 3001 E. Outer Drive, Detroit, Mich. In each unit there is a constant air pressure in the piston return chamber. During the punching stroke, this pressure is overcome by hydraulic pressure obtained through a separate pump. Release of the hydraulic pressure permits the air pressure to return the piston, thus eliminating spring return.

In the accompanying illustration, a group of the units is mounted on a radial type fixture designed to punch 16 holes simultaneously in a disk of ⅛-in. thick steel. The fixture is provided with a foot-actuated work ejector, facilitating removal of the punched part. Additional time is saved by using automatic work locators attached to the spring stripping plates which hold the part in position.

Prescott No. 11 Amalgamated Shell Turning Machine Uses Former-Controlled Contour Turning Attachments

Primarily a shell-turning machine, the No. 11 Amalgamated shell machine made by The Prescott Co., Menominee, Mich., and designed by Lucien I. Yeomans, is adapted to many other uses. The former-controlled contour turning attachments on this machine are adapted to carriages which travel axially along the work. The ways of the machine are cylindrical ground bars of high carbon steel, and are arranged in a vertical plane. They are 2 15/16 in. in diameter, and are spaced 22 in. apart. The frame is of cast iron, in a full box section, carried on two pedestals which may be cast integral or as separate elements of the structure.



A drive shaft, fully inclosed in the box frame, extends from end to end of the machine and has projecting key-seated ends upon which flexible coupling members may be mounted to connect several machines in a group by short spacing-shafts between the machines. The machines may be independently driven, if desired, and in such case motors on the floor drive to a pulley, sheave, or chain wheel located on one end of the shaft. These shafts are 1 15/16 in. in diameter, are mounted in Satco bearings, and normally are operated at 400 r.p.m. It is claimed that they can transmit approximately 100 hp.

Upon the ways is carried a longitudinally movable frame having a bearing length upon the ways of 59 in. This frame carries both the live and tailstock spindles and the whole frame travels with the work. The work is held between the live and dead centers by fluid pressure applied at the tailstock. It is driven by fixtures on the live spindle. The four-point mounting of the frame on the ways may be considered as comparable with an ordinary lathe carriage in which the extreme dimensions on the ways are represented by a 22 x 59 in. rectangle. The spindles are 3 15/16 in. in diameter, and the drive to the live spindle is direct, from a long pinion which is clutch controlled.

The tools used in this machine are longitudinally fixed in position and, in the case of a rough or straight turning operation, may be held in multiple tool holders arranged like a large hollow mill. The work carried through such a tool head is straight turned. In the case of formed work the requirement is for a different tool head upon which oppositely mounted cutting tools are radially movable under the control of a former. All tool heads are located by male and female engaging surfaces

upon a rigid tool carrier arm which is cast integral with the box frame of the machine.

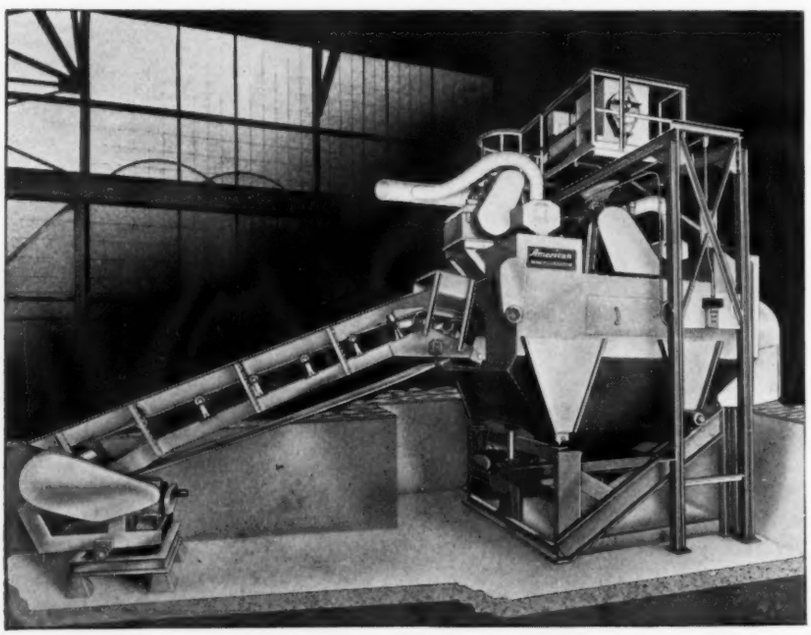
The former used is a circular section at all points, rather than the usual flat surface, and it is the reverse of the work to be produced. It is generated by using a model of the part as a master former. Two rollers, one on each side of the former, engage it and by increase or decrease of their center distances under the control of the former the tools are advanced or retracted relative to the axis of the work. This makes possible the use of tools on opposite sides of the work to machine the same contour. Thus, a fine increment of cut per tool may be secured with double the total feed which would be possible with ordinary formers and single tools. The tools are separately controlled by the circular former.

To change from a formed job to a straight turning job involves only the change of the former tool head to a rigid tool head, or the straight form may be turned with the former tool head by using a straight instead of a contoured former. The machine is operated by inserting the work to be turned between the live spindle driving fixture and the tailstock center, when the movable frame is at the left position of travel and the spindle is at rest. The tailstock center is advanced by operation of the fluid pressure piston, and the spindle clutch lever and feed lever are thrown into engagement. At the completion of the cutting operation, the feed automatically stops and the spindle is stopped, the tailstock center is withdrawn, and the work removed from behind the tool head. The feed lever then is thrown into reverse and the rapid traverse returns the movable frame to position for another cycle of operation.

Capacity of the machine is for shells from 75 to 105 mm., and it will machine such unusual contours as the 81 mm. "avocado" shell. The time estimated for a 105 mm. shell, with appropriate tooling, is 1 min. For shorter shells of less diameter, the time is proportionately less. The design of this machine is such that chip disposal is not a problem, even when using carbide-tipped tools. The space directly below the spindles and tools is entirely clear, and it is possible to use floor chutes, chip crushers or conveyors, as desired, to handle the chips. Actual offset of the center line of the spindles from the face of the box sectioned frame is 11½ in. Weight of this machine is approximately 5,500 lb.

American Continuous Wheelabrator Tumblast Regulates Tumbling Speed and Flow of Work

The continuous Wheelabrator Tumblast cleaning unit, developed by the American Foundry Equipment Co., 555 Byrkit St., Mishawaka, Ind., is made in various sizes for a wide range of type and size of work. Using a combination of tumbling and longitudinal travel of work, together with a double width blast from a wide Wheelabrator, this machine is claimed to surpass in productive capacity any previously offered barrel type blast equipment. The desired cleaning of all parts is made possible by tilting the mill to the proper angle, by varying the speed of the tumbling barrel, and by using the proper abrasive. In order to insure full exposure of work to the blast, both the angle of the barrel and the speed of the apron are made variable, as different types of work require different longitudinal speed and tumbling speed within the barrel.



Any conveyor system can be used for feeding parts to the cleaner and the cleaned castings can be discharged into tote boxes or onto a conveyor system. The work to be cleaned is carried through the blast barrel on an endless apron-type conveyor which constantly tumbles and cascades the work, thereby completely exposing all surfaces of every piece to the full effect of the abrasive blast.

In the Wheelabrator process, abrasive from an overhead storage hopper is fed by gravity through a chute and control case to the center of a wheel which rotates at high speed. By centrifugal force the abrasive is thrown from the wheel upon the product being cleaned or prepared. A cast alloy impeller rotates with the wheel proper and carries abrasive to an opening in the stationary control cage, where it discharges to the blade section of the wheel. At this point, the abrasive is picked up by the inner ends of the throwing blades and gradually is accelerated in its passage to the periphery of the wheel. The final throwing velocity is the result of radial and tangential forces. Change in direction of the blast is attained by turning the control cage which changes the position of the opening. Any type of finish can be obtained on the work by the proper selection of size and type of abrasive. Light metal parts can be given a satin finish, or sand and scale can be blasted from castings, forgings, heat-treated parts, stampings and similar products.

Aber Cherrying Attachment Fits Most Milling Machines

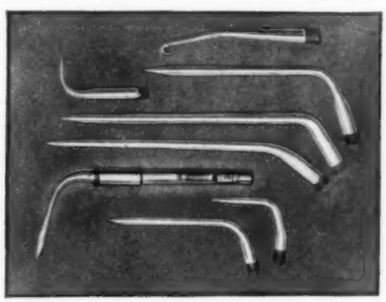
A cherrying attachment offered by Aber Engineering Works, 1613 Flett Ave., Racine, Wis., fits both vertical and horizontal milling machines of most types, and makes it possible to cut sharp corners, channels, undercuts, hollows and concave areas in dies and odd shapes to a variety of depths and diameters. A standard cutter is used for roughing work, then to remove the final 0.015 to 0.020 in., a special cherrying cutter is used.

The attachment is graduated for adjustments around 360 deg. and each unit has an individually calibrated scale to determine work angles. The only part requiring lubrication in this attachment is the worm driving gear, which should be grease-lubricated every three months. Two bolts loosen the cutter driving gear housing to accommodate different diameter cut-

ters. Cone pin bearing points can be separated to accommodate cutters from ¼ to 3 in. in width. Special form cutters for finishing odd shaped work can be used in this attachment.

"Ang-Lite" Units Illuminate Deeply Recessed Areas

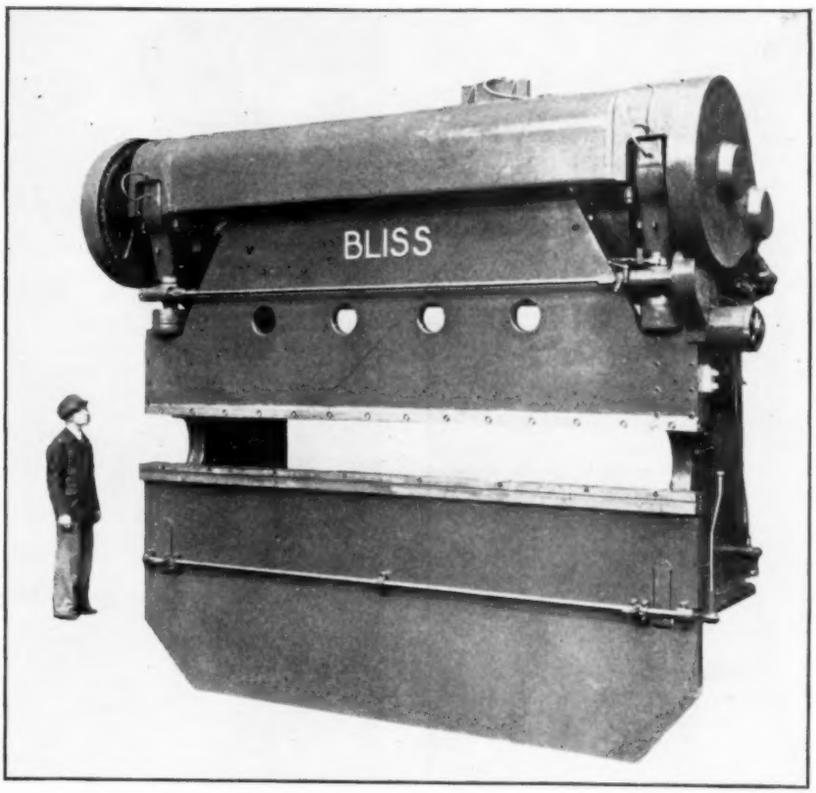
Designed to provide light at various angles in deeply recessed areas where careful inspection is necessary, "Ang-Lites" made by Diagnostic Ultra-Lite Co., 170 Broadway, New York, N. Y., are fabricated from Lucite. They are hand-tooled and are said to be practically unbreakable. They are made in various stock shapes and sizes with ⅜, ½ and ⅝ in. diameter at the threaded end. The handle of the "Ang-Lite" unit is a specially designed pocket flashlight



unit with a telescopic metal sleeve which shields the light source and contains removable reducing bushings into which are screwed the threaded end of the Lucite shapes. When in operation there is approximately 50 to 75 candle power of light at the point or tip, varying with the lengths and degree of the angle. Electric units available with a small plug-in type transformer equipped with a 7 ft. cord and switch, operating on a.c. only, will give approximately 100 to 150 candle power of light. The Lucite pieces are interchangeable from the pocket light unit to the transformer unit.

Bliss Improved All-Steel Press Brakes Employ Electrically Operated Friction Clutch

Latest addition to the line of all-steel press brakes made by E. W. Bliss Co., 53rd St. and Second Ave., Brooklyn, N. Y., is the No. E-12 machine shown. It has a capacity of ¼ x 144 in. in mild steel. Deflection in the bed and slide is held to a minimum by generously proportioned beam members.



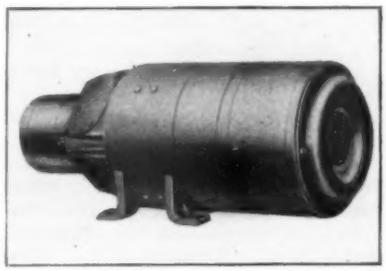
An electrically operated friction clutch designed especially for Bliss press brakes is employed on this machine. Bronze bushings are used for the eccentric shaft and intermediate shaft bearing. A V-belt motor drive is employed. The intermediate gearing is lubricated by oil or grease in oil-tight housings. Guards are employed to retain lubricants for the larger gears.

Specifications for the brake shown are as follows: distance between housings, 150 in.; depth of gap, 12 in.; stroke of slide, 3 in.; adjustment of slide by motor, 6 in.; distance from bed to slide with stroke down and adjustment up, 12 in.; speed of operation, 30 strokes per minute.

G. E. Speed-Variator Unit Provides Ranges to 16:1 Ratio

The General Electric Co., Schenectady, N. Y., has developed as a standard unit a complete speed-variator equipment operating from an a.c. source of supply to provide wide ranges of adjustable speed by means of the generator voltage control scheme. Each equipment consists of an adjustable speed d.c. motor, an adjustable voltage motor-generator set with control, and a separately mounted generator-field rheostat. Standard speed ranges are available up to 16:1 ratio.

The adjustable-speed, d.c. motor can be mounted directly on the driven machine, with the speed-changing control mounted nearby. The units are designed to operate from three-phase, 60-cycle, 220-, 440- and 550-volt a.c. power. The potenti-

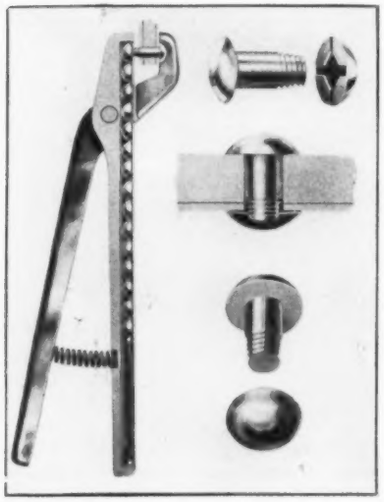


ometer-type generator-field rheostat provides speed changes in small increments over wide ranges. The speed variator is suitable for many industrial applications where adjustable speed has a direct bearing on control of quality and efficient output of the driven machine.

Hopkan Spring Fastener Will Not Vibrate Loose

An improved fastener with a spring locking button has been developed by Hopkan Rivet Co., 128–130 Latham St., Pittsburgh, Pa., for use in the same manner as present speed nuts and screws. It presents a finished appearance in exposed places. The spring locking button and fastener is so designed that it will not loosen from vibration when assembled.

The fastener stud, having a head



and shank, is inserted from one side of the assembly and the spring locking button, which can be made in any size or shape, is applied with a specially developed tool. The shank is tapered toward the end and is provided with a number of parallel grooves. A spring in the locking button engages the grooves in the stud to hold the assembly together. These fasteners can be made from any type of alloy.

FabriSteel Machine Sets "Fast-On" Lock Nuts

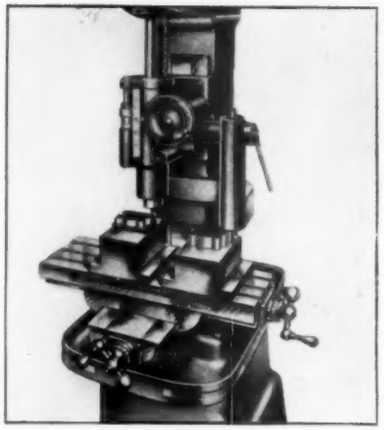
A special machine for setting "Fast-On" lock nuts where large-scale production is required, has been developed by FabriSteel Products, Inc., Kerr Machinery Bldg., Detroit, Mich. The nuts are fed from a continuous rotating hopper which has a capacity for 1,000 nuts of ¼-in. size. These nuts are fed to an anvil where the clutch is tripped and the "Fast-On" nut is locked into place. The machine has a speed of 200 r.p.m. and, on the assembly of small parts, it is claimed that 2,500 lock nuts easily can be set per hour.

The machine has a non-repeating clutch, the crank is locked in dead center position and only then can the machine be tripped. As fast as a nut is locked into place, another nut is fed into position ready to be

installed. Height of working position above floor can be adjusted from 34 to 39 in., assuring the operator a comfortable working position. Safety anvil design eliminates the possibility of overloading the machine or stalling the motor.

Vernon Profiling Attachment Applicable to Contour Milling

A profiling attachment has been developed by Machinery Mfg. Co., P. O. Box 155, Vernon Branch, Los Angeles, Calif., for use on the Vernon combination vertical mill and jig borer. The sliding head of this attachment



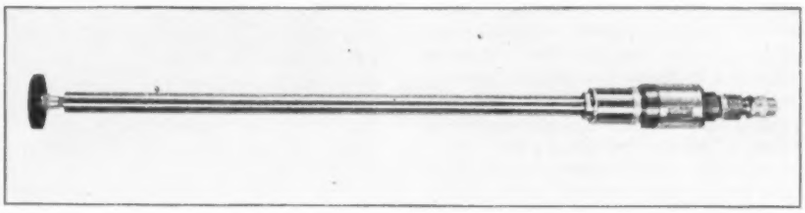
is so constructed that the attachment easily can be engaged and disengaged. The attachment was developed especially for small lot machining of irregularly shaped forgings, but it also is applicable to contour milling from wood, plaster or plastic models.

Atlantic Grinding Wheels Handle Difficult Metals

To meet the need for special grinding wheels for efficient use on the more difficult metals, Atlantic Abrasive Corp., 516 Pearl St., South Braintree, Mass., has introduced two new types of wheels. The Type L. A. is a hard-tempered wheel for general use on aluminum, copper, zinc, brass, iron, steel and stellite. Wheels made in the finer grain sizes of this type are claimed to be ideal for precision grinding. The Type S. C. is a soft-tempered wheel, made in all grain sizes from coarse to fine, and designed for fast, clean grinding of metals such as stellite, carboloy and alloyed steels. Both of these wheels are made with a new synthetic bond which is said to make them run cooler under the toughest grinding conditions. Clogging and glazing are said to be eliminated, as is the danger of burning.

Rotor Pneumatic Grinders Use Small Wheels

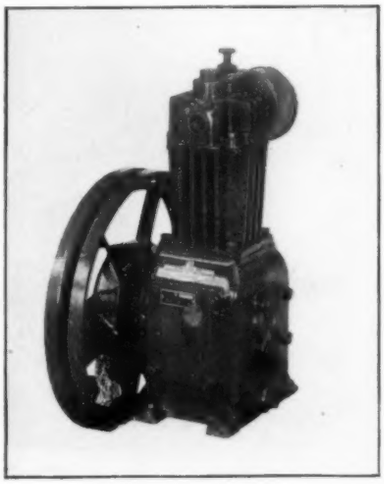
The Rotor Tool Co., 17325 E. Euclid Ave., Cleveland, Ohio, has announced two new production-type die grinders for use with wheels ranging from ½ to 2½ in. in diameter. The No. M-825 grinder shown features an extension of either 13 or 26 in. for cleaning up the inside of shells. The side to center clearance of this machine is reduced to ½ in., weight is 7 lb. The No. M-826 grinder is designed for getting into otherwise inaccessible places, the side to center



distance being only 19/32 in. Speed of this grinder is 17,000 or 21,000 r.p.m.; weight is 2¾ lb. Various types of handles, such as sleeve twist, spade, button safety or right-angle throttle, are used interchangeably on both of these grinders. The manufacturer states that the motors of both units have ample power for holding high load speed for fast cutting and long wheel life.

Sullivan Type Q Compressors Have Cushioned Air Valves

The Sullivan Machinery Co., Michigan City, Ind., now is offering a group of small air compressors



known as Type Q units. These compressors are air cooled, single and two-stage and range in capacity from 2.8 to 4.57 cu. ft. per min. with operating pressures of 100 to 200 lb. per sq. in. under continuous loads. The pressures under intermittent loads are 150 to 500 lb. per sq. in. These Type Q compressors have cushioned air valves, a balanced crankshaft, taper roller main bearings, Lynite connecting rods, semi-steel pistons, positive lubrication, a copper intercooler, chrome nickel cylinders and a dust-proof crankcase. Automatic starting can be furnished. Units are available bare, base mounted or tank mounted, for V-belt drive from an electric motor or air-cooled gasoline engine. Motor sizes range from ½ to 10 hp.

Crucible Offers "Rezistal" Stainless Steel Electrodes

"Rezistal" stainless steel electrodes, developed by Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y., for the electric arc welding of stainless steel, combine stainless base wire and a coating employing recent developments in flux coating composition. These electrodes are of the extruded flux coated type, assuring concentricity of coating and stability of arc for all position welding. The coating is designed to prevent oxidation of the weld metal, and to maintain virtually the same chemical analysis and physical properties of the deposited metal as of that in the parent metal. The slag produced by the coating is easy to remove. Six standard types of these electrodes are available for the various stainless steels. They are available in diameters from 1/16 to ¼ in., and in 9-, 11-, and 14-in. lengths.

Ergolyte Arc Welders Have Glass Insulation

Two continuous a.c. arc welders have been made available by the Ergolyte Mfg. Co., 3644 Lawrence St., Philadelphia, Pa. All controls and sockets on these welders have been brought into full view on a sloped panel, eliminating the necessity for crouching to select heats or make adjustments. Heats may be selected in gradual steps over a wide range. Transformer insulation is double spun glass.

These welders employ a broken wave current produced by a special transformer winding which, it is

claimed, makes them stable and quiet in operation regardless of how unsteadily the electrodes are held. The No. 160 model has a current range of 15 to 160 amp. The No. 250 welder shown has a current range of 15 to 250 amp. These welders operate on single phase or on one phase of two or three phase circuits.

New Timken Bearing Series Are of Standard "SS" Type

The Timken Roller Bearing Co., Canton, Ohio, has put into production a new bearing series of the standard "SS" type. The first bearing in this series is No. 9285-9220, with a cone bore of 3 in., outside diameter of 6⅜ in. and width of 1⅝ in. At 500 r.p.m., this bearing has a radial capacity of 6,255 lb. and a thrust capacity of 8,710 lb. The Nos. 9100, 9300, and 9000 bearings of the "SS" type have also been redesigned to reduce the outside diameters and width of each series while still maintaining the same load carrying capacities. These series in addition to those now available in the "SS" type provide a wide range of capacities, varying in cone bores from ⅜ to 12½ in. The "SS" series are single row bearings with steep cup and cone angles. They are designed primarily to handle those loading conditions where thrust loads are large compared to the radial loads.

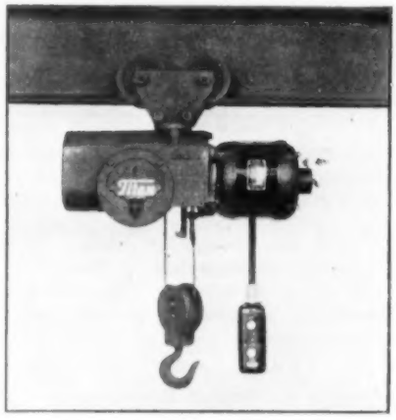
Guth Plastic Diffuser Made for Fluorescent Lamps

A plastic device which snaps on to a fluorescent lamp to reduce glare from bare lamps has been made available by the Edwin F. Guth Co., 2615 Washington Blvd., St. Louis, Mo. This device is called the "P-F-C" (plastic fluorescent channel) and is applicable for both 1- and 1½-in. lamps. These channels are available in five colors, white, light blue, yellow, pink and pale green. They are shatter-proof.

Detroit "Titan" Hoists Plug in Lighting Circuits

The "Titan" electric hoist made in 250, 500 and 750 lb. capacities by Detroit Hoist & Machine Co., 8201 Morrow St., Detroit, Mich., is a completely inclosed unit of compact construction made for lamp socket plug in, or for power circuits. Hoisting speeds range up to 60 ft. per min. They are made for hook or trolley suspensions.

The hoist mechanism has only two



gear reductions, a cone worm of continuous area contact, and a set of helical gears. An electric solenoid brake, capable of sustaining the full load is provided on the hoist motor

as standard equipment. This brake is fitted with molded brake liners and has a continuous duty solenoid. Independent of the solenoid brake, the locking action of the cone worm in the hoisting mechanism positively holds the load at any point.

Emerson Electric Motors Have Pressed Steel Frames

A line of shaded pole electric motors in pressed steel frames has been announced by the Emerson Electric Mfg. Co., 2088 Washington Ave., St. Louis, Mo. These ventilated motors are available in two frame sizes, with capacities ranging from approximately 1/400 to 1/25 hp.

The small frame is furnished with a detachable strap base and the large frame can be furnished with rigid saddle base or resilient hub mounting. All ratings can be furnished without base, with extended through-bolts for stud mounting. Frames are equipped with self-aligning wool-packed, oil impregnated bearings. These motors are suitable for vertical operation, with shaft end up.

Stackbin Welded Bench Used Alongside Machines

All-welded steel construction gives this machinist's bench, made by Stackbin Corp., 42 Troy St., Providence, R. I., life-long rigidity without periodic tightening of bolts or rivets. Originally designed to be used alongside machines, the top of this bench is ⅛ in. thick steel, shelves are No. 14 gage steel, and legs are heavy angle steel. The bench can be equipped with a lock drawer, if desired. The model illustrated has a 20 x 24 in. top and is 30 in. high. These dimensions can be varied to suit individual requirements.

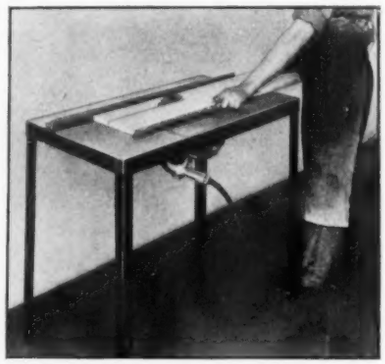
Bristol Pyrometer Controller Operates in a Vacuum

Moving parts in the control circuit, such as motors, depressor bars, toggle switches and open contacts, are eliminated in the electronic pyrometer controller developed by the Bristol Company, S. Main St., Waterbury, Conn. The pointer of the Weston millivoltmeter movement is not engaged or retarded at any point within its normal operating range, thereby leaving it free to continuously indicate the temperature under control. This measuring unit is equipped with a cold-end compensator, insuring high accuracy.

Control is accomplished by means of a new electronic circuit, using a single high-output vacuum tube of the all-metal type. A milliammeter on the front of the instrument indicates the condition of the control circuit at all times. Due to the use of a "Millivac" relay, the control is extremely sensitive to changes in temperature at the thermocouple. The entire operating mechanism of this relay is totally inclosed in a vacuum. A full description of the controller is given in Bulletin No. 544.

Van Dorn Saw Table Holds No. 85 Quick-Saw

A portable saw table has been developed by Van Dorn Portable Electric Tools, Towson, Md., to convert the No. 85 Quick-Saw to saw table use for maintenance operations. The saw table of the portable saw locks in place in the center of the table top and all depth and angle adjustments of the portable saw can be made in saw-table use. This table is made of heavy gage metal with demountable legs, an adjusting ripping guide and clamps to hold the saw in place.



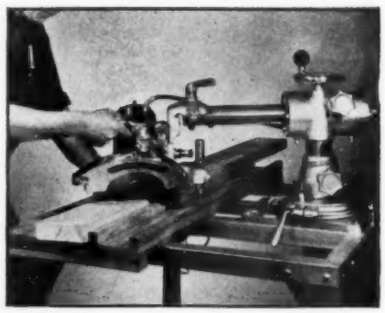
Small Vertical A.C. Motors Offered by Fairbanks-Morse

A line of integral horsepower, vertical, single-phase motor in sizes from ¾ to 5 hp. has been announced by Fairbanks Morse & Co., 600 S. Michigan Ave., Chicago, Ill. These motors, because of their electrical and mechanical characteristics, are claimed to be adaptable for operation in isolated localities where they will receive little attention. Design is such that dripping or splashing water will not reach vital parts under normal operating conditions. Operating speeds are 1200, 1800 and 3600 r.p.m. All 1800 r.p.m. and slower motors are built in the repulsion-start induction-run type. The 3600 r.p.m. ratings start as a repulsion motor, and as the speed rises, the imbedded squirrel-cage winding in the rotor picks up a large portion of the load automatically.

Porter-Cable Radial Arm Supports Speedmatic Saws

A radial arm unit for supporting "Speedmatic" electric hand saws has been developed by Porter-Cable Machine Co., Syracuse, N. Y. to speed maintenance operations. When a radial sawing machine is required, the shoe is removed from the Speedmatic saw, and the motor unit mounted on the radial arm.

This radial saw has several advantages: the arm moves back clear of the table so that stock can be arranged quickly for sawing, the arm provides a stroke of 26 in., the rib guides may be placed to the rear so that stock 65-in. wide may be halved, and the arm may be raised 7¼ in. by means of a large handwheel. The regular adapter permits tilting the saw unit 45 deg. A special adapter is available which will permit tilting the saw 90 deg. Cut-off capacity is 4½ in. deep with a 26 in. stroke.



Stearns Magnetic Separator Reclaims Metal Turnings

A double magnetic pulley separator unit, designed to separate brass and iron turnings and borings has been built by the Stearns Magnetic Co., Milwaukee, Wis. By combining two magnetic pulley separator units in one machine, rapid separating of these materials is effected. The top unit consists of a 15-in. diameter magnetic pulley, 30 in. wide with vanner edge belt and tail pulley, and the lower unit has a 12-in. by 30 in. magnetic pulley. The material is fed either into the bulk hopper or into the chute below. In the process of separation, the coarse material is picked up by the upper magnetic pulley, while the lower magnetic pulley unit serves as a refining or secondary separation. Long and odd-

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Turning, facing, boring Hy-Ten B3X hot rolled steel feed gear—one of the several hundred Carboloy Tool STEEL CUTTING applications in the Gisholt plant.

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To meet the problem of applying carbide tools economically on the small-lot, diversified work typical of the machine tool industry (as compared to continuous production applications), Gisholt adopted the following procedure:

1. A carbide "application man" was appointed within the plant to control all use and maintenance of carbide tools.
2. Ten basic styles of carbide tools were designed for general purpose use on 80% of the work in the shop.
3. Two grades of Carboloy—one for steel, one for all other metals—were selected for universal use.
4. A uniform method of carbide tool application was set up and adequate grinding facilities provided.

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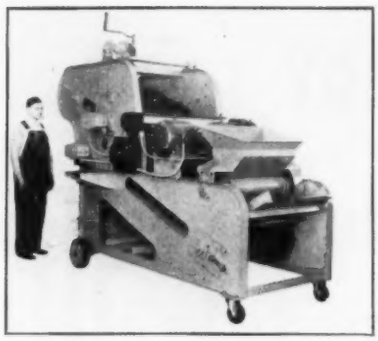


shaped pieces are fed into the lower chute. This separator can be furnished in a wide variety of sizes and combinations.

"Hygrade" Lighting Units Designed for General Use

Employing two 40-watt fluorescent lamps, the No. C-101 "Miralume" fluorescent lighting units offered by Hydrade Sylvania Corp., Salem, Mass., is a 100-watt unit designed for general commercial illumination. In this unit the lamps and chassis are housed in a triangular shaped, glass-paneled shade. Over-all dimensions are: length, 49 in.; width, 10 in.; height, 4½ in. Units are available for operation on either 110–125 volts or 220-250 volts, 60 cycle A.C. The fixture comes assembled and wired, complete with lamps.

Westinghouse D.C. Wattmeter Operates from Ammeter Shunt

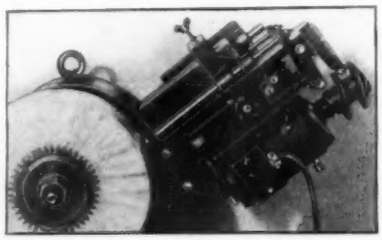
A direct current wattmeter which operates from a standard 50-millivolt ammeter shunt has been announced by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Construction is similar to that of the usual d.c. shunted ammeter, except that the magnetic field is produced by an electromagnet energized from the line voltage. This magnetic circuit is made from Hipernik, an alloy of iron and nickel. Existing shunts and long, small wire shunt leads as for ammeters may be used for the current circuit of these wattmeters. These instruments are available in the conventional 5½-in. square or 7½-in. round switchboard cases.

Production Counter Uses Plastic Wheels

The Production Instrument Co., 702-06 W. Jackson Blvd., Chicago, Ill. offers the "Silver King" mechanical counter for industrial applications. This counter is the result of four years of development during which each operating function of the counter has been studied. Number wheels now are made from bakelite plastic, reducing by 85 per cent the weight that must be started and stopped with every count. Unbreakable windows of reinforced plastic material are used. Action of this counter is said to be so positive and effortless that a model on test counted at the rate of 60,000 per hour, and on long runs at the rate of 36,000 per hour. Although not designed for these high speeds, they are indicative of the long life claimed at normal speeds.

Packer Composition Applicator Driven by Electric Motor

A compact, self-contained applicator for automatically applying buffing compounds to buffing wheels has been developed by the Packer Machine Co., Meriden, Conn. This applicator operates independent of any external cams, projecting lugs, and is not dependent upon buffing machine speed. It now is standard equipment on all "Packer-Matic" automatic polishing



and buffing machines, and can be attached to all types of buffing machines. Smooth, uniform application of composition is claimed.

The composition holder on this applicator will hold blocks of any size up to 8 in. wide. Length of cake is not limited to the usual commercial sizes. Wheel face and cake can be the same width. The motor unit imparts a smooth, regular rocking motion of the composition cake to the buffing wheel. The unit is driven by a 1/20 hp. motorized reduction unit.

New Wrinkle Offers "Wrintex" for Facilitating Finishing

The "Wrintex" resin developed by New Wrinkle, Inc., Dayton, Ohio, is claimed to produce a wrinkled texture under any and all conditions. The solution contains 60 per cent resin by weight in 40 per cent Xylol. The high solid content permits a wide range of solvents for after-thinning.

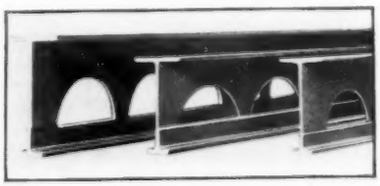
The solution will stand the addition of an equal volume of naphtha, if the naphtha is stirred in gradually. Immediate baking is not necessary. "Wrintex" enamel has been allowed to air-dry overnight and then has been baked. It developed the same texture as a panel placed in the oven shortly after spraying. The finish baked hard. When reduced for free spraying, it will bake hard in one hour at 200 F.

H.-V.W.-M. Insulating Joint Suitable for Steam Lines

An improved hose-type insulating steam joint has been developed by the Hanson-Van Winkle-Munning Co., Matawan, N. J. This joint consists of a special seamless rubber tube, compounded to resist steam and heat, covered with plies of strong, closely woven duck. Between these plies are placed layers of insulating rubber. A heavy gage cover is applied on the outside of the joint. Each joint is 8 in. long and is built to stand 100 lb. steam pressure. It is furnished complete with hose clamp on each end for attaching to standard pipe. The joints are claimed to be fully adequate for all of the normal conditions of acid and other chemical handling equipment in plating rooms.

Cleveland Arch Beams Made for Tramrails

A new series of tramrail arch beams for overhead materials handling systems with loads up to five tons has been announced by the Cleveland Tramrail Div., The Cleveland Crane & Engineering Co., Wickliffe, Ohio. This series consists of three different sizes of arch beam. No. 3000 has a depth of 12 in. and a weight of 28 lb. per ft. Having the same depth, Beam No. 3100 weighs 33 lb. per ft. No. 3200 has a depth of 15 in. and weighs 50 lb. per ft. This arch beam is a compound section consisting of a wide flanged T-member to which is welded a specially rolled rail. The



vertical member of this T-section is arched at regular intervals, reducing the weight to a minimum without sacrificing strength. The wide top flange adds stiffness and prevents buckling of the beam, even when used for very long spans with heavy loads.

McKenna Metals Announces Tungsten-Titanium Carbide

A new grade of Kennametal tungsten-titanium carbide alloy, which is said to combine unusual hardness with toughness, has been developed by McKenna Metals Co., 103 Lloyd Ave., Latrobe, Pa. Listed as Grade K3H, this alloy is recommended as a tool tip material for light finishing cuts and for fairly heavy continuous cuts on steel of all hardnesses up to 550 Brinell. Tool tips of this material are sup-

plied in three standard shapes, or in special shapes made according to requirements. Kennametal K3H has a hardness of 79.0 Rockwell C and a strength of 210,000 lb. per sq.in. on the transverse rupture test.

Post Transparent Medium Blue Prints Like Ink

Ink like opacity from hard drawing pencils is claimed for a transparent medium that is not a tracing cloth and not a vellum, offered by the Frederick Post Co., P. O. Box 803, Chicago, Ill. Blue prints made from drawings produced from ordinary hard drawing pencils on this medium have a solid background and sharp white lines. On "Blacline" prints, the detail is solid and sharp, and the background is uniformly white. Standard rolls are 20 yd. long, and 30, 36, 42 or 54 in. wide. It also is available in plain or printed sheets. The back or reverse side of this "P.T.M." is dust protected by the ice glazed finish, similar to the reverse side of tracing cloth. The surface is moisture-proof.

Kirkland Indicating Lamps Have Small Lens Diameter

A molded plastic unit for use in indicating lamp service has been announced by the H. R. Kirkland Co., Morristown, N. J. Known as the No. T2 unit, this device has an extremely small lens diameter, which is said to make it suitable for many applications where larger units cannot be used. So constructed as to allow a full 180 deg. of light over the lens cap, even under rays of strong exterior light, this unit also incorporates an "Anti-false" color feature. That is, the plastic shell and lens-cap are molded in the same color, making each unit a matched set. In this way, danger of inserting a wrong color lens cap into the unit is kept at a minimum. Available colors are red, green, amber, blue and milky white.

Eclipse Extension Gun Sprays Ceilings Easily

The Eclipse Air Brush Co., 390 Park Ave., Newark, N. J., has placed on the market an improved Type EX extension spray gun for painting large surfaces beyond the natural reach of the operator without the use of scaffolding and staging. The extension gun is supplied in lengths up to 12 ft., and the operator can paint an average wall and ceiling without having to climb. It is also used for painting large surfaces such as railroad cars and ship hulls. This gun has a detachable gun grip control and different lengths of shaft can be used in the same grip. The shaft turns in the grip so that the spray can be directed as required. The

(advertisement)

Modern Flame Cutting Methods Save Time and Money

Thousands of American manufacturers are saving considerable time, trouble and money by taking advantage of the complete flame-cutting service offered by the ten Ryerson Steel-Service plants.

Modern burning equipment manned by specially-trained operators, and large, complete stock of Ryerson Certified Steels make possible speedy and accurate cutting to exact specifications. Any shape can be burned from standard O. H. high carbon or alloy steel plates and billets ¼" 15" thick. Inside cuts are easily made, so there is no limit to the intricacy of shape that may be secured.

As cut edges are accurate and clean, little, if any, machining is necessary. Parts can be cut singly or in quantities, automatic equipment assuring uniformity on duplicate pieces.

Ryerson engineers will be glad to help you on any special problems, suggest possible savings, and submit estimate of cost. Send a blue print or sketch of any application you may have in mind to the Ryerson plant nearest you. See advertisement below.)

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"Vacation without a Worry" PLAN

● You can have a real vacation this year and every year . . . if you follow Ryerson's "Vacation Without a Worry" plan. No need to wonder about interrupted shop schedules! No need to worry about uncertain or delayed steel deliveries!

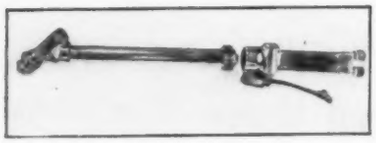
Just leave a memo saying: "Call on Ryerson when steel is wanted." That's all! Because you have complete assurance that all emergency and regular orders will be handled with equal care. Ryerson has thousands of tons of steel —all certified quality—on hand for immediate shipment.

So . . . close you desk! Pack your bags! Have fun, and relax! Ryerson is on the job.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Buffalo, Cincinnati, Cleveland, Detroit, Boston, Philadelphia, Jersey City.

RYERSON CERTIFIED STEELS

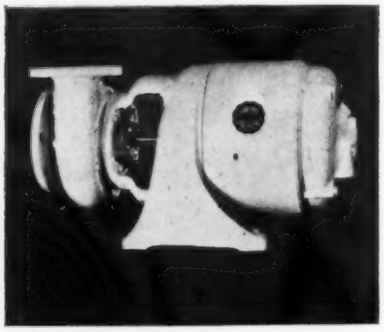
RYERSON



spray head is supplied in either of the two standard models to insure proper application of all types of materials.

U. S. Pyramidal Base Motor Aligns Motor and Pump

A pyramidal base motor developed by U. S. Electrical Motors, Inc., Dept. 33, 80-34th St., Brooklyn, N. Y., does away with the possibility of misalignment which often develops in connecting a horizontal centrifugal pump to its motor. The mounting is an integral part of the motor. The motor



support on which the pump casting is attached carries the load of the pump, instead of permitting any of the weight to be imposed on the shaft. This design may be used for any machine where perfect alignment is essential, in addition to the driving of centrifugal pumps.

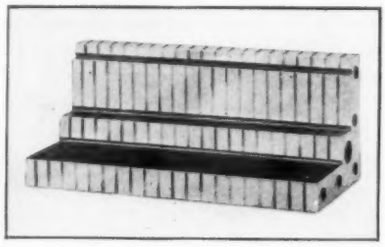
Ward Leonard Midget Relay Has 1 Hp. Capacity

Ward Leonard Electric Co., Mount Vernon, N. Y., has made available a midget relay known as Bulletin 105. Designed for use on either a.c. or d.c., this relay is available with contacts arranged for single pole, normally open, normally closed or double throw.

The relay is rated to handle approximately 1 hp., and is furnished with coils for operation on standard voltages up to 115 volts at standard frequencies. With over-all base dimensions of 2⅝ in. x 1⅞ in. and an over-all depth of 1½ in., the relay can be mounted in the standard wall-type pushbutton box.

Scherr "Magne-Blox" Angle Holds Parts on Chuck

The "Magne-Blox" angle iron offered by George Scherr Co., 128 Lafayette St., New York, N. Y., is designed for holding work of all types on magnetic chucks. The angle iron consists of a series of steps measuring 3/16, ⅜, ½, 1 5/16 and 1⅝ in. wide upon which may be placed pieces for surface grinding without complicated clamps and attachments. Over-all dimensions of the block are 3x3x7½ in. With the use



of a sine-bar or a bevel protractor, work requiring grinding operations at various angles may be laid out and fastened to the side of the angle iron.

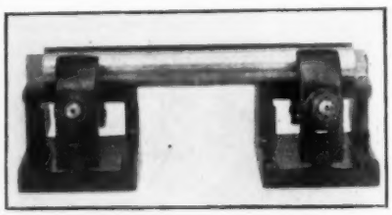
Van Dyke Lighting Unit Designed for Metal Workers

Van Dyke Industries, 2900 Halsted St., Chicago, Ill., offer a No. 5000 adjustable fluorescent lighting unit for factory applications. The arm on this unit has three extension joints which permit the light to be thrown in any direction. Fittings are available for bench, wall or pipe mounting; all of these can be used with the standard arm. The units are available for either a.c. or d.c. operation.

This company also is offering a screw-in socket fluorescent lamp which is suitable for use over production lines and for general illumination wherever fluorescent lighting is desirable. It is supplied for either 15 or 20 watt fluorescent tubes, and is listed as the No. 3001 unit.

Hart Milling Fixtures Save Set-Up Time

Suitable for work on drill presses, shapers, surface grinders or milling machines, these set-up fixtures developed by Hart Machine Co., 26 Mather St., Dorchester, Boston, Mass., have semi-steel bodies and Z-metal clamps. These fixtures are available in



four sizes for ⅜ to 5 in. round stock. T-slot blocks are removable on all fixtures. These blocks measure ⅝ in. on the smaller sizes, and ¾ in. on the large size.

Hunter Sensitized Linen Photoprints from Drawings

A sensitized linen that will reproduce a master positive copy from a pencil drawing for use in every respect like a tracing, has been brought out by Hunter Electro-Copyist, Inc., Syracuse, N. Y. This copy is made by contact photoprinting in ordinary office light, with complete elimination of ink tracing by hand. The trade name given this product is "Heccotex". It is sized and waterproofed to take an office-light emulsion with a non-halation backing. The linen does not shrink or stretch when immersed and therefore makes possible true-to-scale printing of blueprints or other types of drafting room reproductions. The linen is available in 12, 18, 34 and 36-in. rolls, as well as in cut sheets.

Cutler-Hammer Breaker Has Insulated Neutral

Cutler-Hammer, Inc., 205 N. 12th St., Milwaukee, Wis., has announced a change in the case construction used with Type MB Multibreaker assemblies. The device now has an insulated groundable neutral combining the construction of the insulated and the grounded neutral. Simply inserting a screw in a tapped hole of the insulated neutral bar grounds the neutral and the case. These assemblies are available with from 1 to 16 breakers which can be arranged for 2 or 3 hole solid neutral circuits for a.c. service. Units are furnished in flush and surface mounting types.

NEW MATERIALS

"Vicalloy" Alloy Developed By Bell Telephone Laboratories

"Vicalloy" a magnetic alloy of remarkable qualities, was announced to the American Physical Society not long ago by E. A. Nesbitt and G. A. Kelsall of Bell Telephone Laboratories, New York, N. Y. Composed of cobalt, vanadium and iron, the alloy can be made to hold more permanent magnetism than any commercial material. In addition, it can be drawn and rolled—a property not possessed by other permanent magnet materials of importance. For example, it has been rolled into tape 1/500 in. thick and 1/20 in. wide.

Taking its name from the initial letters of its three components, the new material is composed of 6 to 16 per cent vanadium, 30 to 52 per cent iron, and 36 to 62 per cent cobalt. From the molten state it is cast into an ingot, which is hot-swaged to ¼ in. diameter. It then is drawn into wire or rolled into tape as desired. When in final form, it is heat-treated to develop its magnetic qualities. It is permissible to use a heat-treat-

ment that will not be harmful to most high-permeability materials. Thus it is possible to weld such pieces to the magnet and heat-treat them both together.

TRADE PUBLICATIONS

ABRASIVES Information concerning recent improvements in abrasive snagging wheels for foundry and billet grinding is provided in Bulletin No. SA-62, published by Abrasive Co., Philadelphia, Pa.

ARC WELDERS Information on the construction and application of transformer type welders is available in a booklet published by the Glenn-Roberts Co., Inc., of Oakland, Calif.

BALANCING MACHINES A description of a line of static and dynamic balancing machines for locating and measuring unbalance in rotating parts has been published in booklet form by Gisholt Machine Co., Madison, Wis.

BALL BEARINGS Booklet No. R-3 issued by New Departure Div., General Motors Sales Corp., Bristol, Conn., is their 1940 edition of Ball Bearing Interchangeability Tables.

BEARING ALLOYS Lumen Bearing Co., Buffalo, N. Y., has published a 70-page supplement to its Engineers' Handbook, containing details of the physical and metallurgical properties of latest non-ferrous bearing alloys.

BELT CONVEYORS A 48-page illustrated booklet describing applications of mechanical elevating and conveying equipment has been published by Link-Belt Co., 307 N. Michigan Ave., Chicago, Ill.

BRAZING A leaflet issued by Charles Hardy, Inc., 415 Lexington Ave., New York, N. Y., discusses properties of "Powder-Braze" for low-temperature brazing.

BROACHING MACHINES Bulletin Nos. 23001 and 24001, published by the Oilgear Co., 1302A West Bruce St., Milwaukee, Wis. illustrate and discuss the operation of vertical surface broaching machines with automatic shuttle tables.

CARBOLOY Engineering Bulletin No. GT-120, entitled "Recommendations for Machining Steel," published by the Carboloy Co., 11149 E. Eight-Mile Road, Detroit, Mich., provides 12 pages of detailed information concerning proper use of Carboloy-tipped tools in machining steel.

CHART A wall chart entitled "Helps for Sheet Metal Men," offered by Niagara Machine & Tool Works, 637–697 Northland Ave., Buffalo, N. Y., tabulates circumferences and areas of circles, provides fractional and decimal equivalents of U.S. gage sheet iron, and includes formulas for estimating metal for duct work.

CHUCKING AND TURNING Bulletin Nos. 108, 110, and 111, offered by Potter & Johnston Machine Co., Pawtucket, R. I., describe and illustrate the features of automatic chucking and turning machines.

CLAD STEEL Jessop Steel Co., 595 Green St., Washington, Pa., has issued a 24-page booklet containing considerable information and specifications concerning "Silver-Ply" stainless clad steel.

CLEANING A leaflet offered by Wayne Chemical Products Co., Detroit, Mich., discusses methods of cleaning paint spray booths.

COUNTERBORES Catalog No. 35R, offered by Ecilpse Counterbore Co., 7410–34 St. Aubin Ave., Detroit, Mich. includes prices and sizes of counterbore tools.

COUPLINGS Catalog No. 443, issued by Farrel-Birmingham Co., 344 Vulcan St., Buffalo, N. Y., contains 44 pages of design and engineering data concerning a line of "Gearflex" couplings.

CRANES An illustrated booklet which describes cranes to be used in foundries, machine shops, railroad shops, etc. is offered by Whiting Corp., Harvey, Ill.

CUTTERS & GRINDERS Pamphlet No. 1317-B issued by George Gorton Machine Co., Racine, Wis. notes prices and illustrates an increased volume of small tools and accessories.

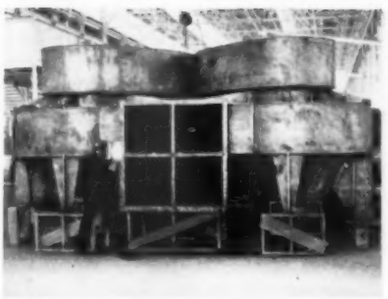
CUTTING SPEEDS Conversion tables showing r.p.m. required for turning bar stock at surface speeds of 90–550 ft. per min. with "Kennametal" carbide tools have been made available by McKenna Metals Co., 103 Lloyd Ave., Latrobe, Pa.

DIE HARDENING A six-page illustrated folder No. S-8541 circulated from Dept. 8-N-48, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., gives descriptive details of a die hardening electric furnace.

DIE-MAKING Grob Brothers, Grafton, Wis., has issued a two-page leaflet which illustrates and describes a new die-making machine.

DIES AND VISES A 26-page folder circulated by the Producto Machine Co., Bridgeport, Conn., illustrates new stocks of die sets, accessories, and machine vises.

DRILLING AND TAPPING—Edlund Machinery Co., Cortland, N. Y., has



YOUR HORIZONTAL FILLETS WILL COST LESS MADE WITH

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THE HEAVY COATED "HOT ROD" THAT PROVIDES CLEANER WELDS AT HIGHER CURRENTS

Specially designed for high speed horizontal fillet welding, Murex Fillex Electrodes help reduce welding costs.

Even at high amperages, Fillex Electrodes produce sound, evenly proportioned fillets without undercutting and with a minimum of spatter. Slag is easily removed, resulting in real savings in time on multi-pass work. Weld surfaces are smooth and welds require little or no cleaning.

Write and ask to have Fillex demonstrated on your horizontal fillet welding applications.

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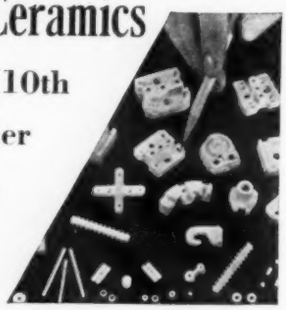
A COMPLETE LINE FOR EVERY WELDING APPLICATION

Investigate Thermit Welding, too—in use since 1902 for heavy repair work; crankshafts, housings, frames, etc.

DoAll Makes Dies for Ceramics

in 1/10th Former Time



Photograph shows ceramic parts, some as small as 1/16" sent us by Sutpakoff Laboratories of Pittsburgh. They write: "We are pleased to mail you ceramic samples. Note these are miniature parts. Dies are made of Mangana Steel and our DoAll 'walks right through' the most complex design in from ¼ to 1/10 the usual time. The DoAll is one of our most versatile and time saving machines."

FASTEST METHOD TO CUT ALL METALS

A moderately priced, rugged precision machine tool that replaces shaping, milling and lathe work with enormous savings of time, labor and metal. Cuts out internal and external shapes from any metal up to 10" thick.

Used in large and small plants in 30 countries by manufacturers of all kinds of metal goods, machine parts, dies and tools, appliances, equipment, motor cars, airplanes, also by ship builders, railroads, arsenals, etc.

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New Handbook on Contour Machining—158 pages of valuable metal working helps.

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issued two illustrated bulletins concerning a line of drilling and tapping machines. No. 103 contains 8 pages covering the Nos. 4B and 1A machines, while No. 101 provides 8 pages of information concerning the Nos. 2B and 3B models.

DRILLS Whitman & Barnes, 2108 W. Fourth St., Detroit, Mich., has issued a 4-page leaflet entitled "The Right Drill for Every Job," which describes six types of drills for various materials.

FILES Nicholson File Co., Providence, R. I., has issued a four-page pamphlet describing a file to be used on stainless steel and other alloy steels.

FILING TOOLS A four-page circular No. D-357 which describes filing machines has been published by Continental Machines, Inc., 1301 Washington Ave. South, Minneapolis, Minn.

FLEXIBLE COUPLINGS A 12-page pamphlet issued by Charles Bond Co., 617–623 Arch St., Philadelphia, Pa., provides specifications of several types of flexible couplings.

GAGE BLOCKS A leaflet issued by Johansson Div., Ford Motor Co., Dearborn, Mich., provides prices of chrome-plated Johansson gage blocks.

GEAR ACCURACY A four-page folder, circulated by National Broach & Machine Co., Detroit, Mich., explains the operation of gear checking equipment.

GEAR HOBBERS Bulletin No. 218, circulated by Gould & Eberhardt, Newark, N. J. describes a new line of universal manufacturing type gear hobbing machines.

GEARS A 7-page folder circulated by Cross Gear & Machine Co., 3250 Bellevue Ave., Detroit, Mich., illustrates the features of a gear tooth burring machine.

GEARS A 52-page booklet containing a number of articles on factors affecting gear production has just been released by Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

GEARS Catalog No. 39, published by Illinois Gear & Machine Co., 2108 N. Natchez Ave., Chicago, Ill., includes prices and engineering data on many types of cut gears.

GRINDERS Brown & Sharpe Mfg. Co., Providence, R. I., has issued a 20-page booklet which describes and illustrates a wide variety of grinding machines.

GRINDING 24 pages of information and data concerning internal grinding equipment are provided in Form No. 30, issued by Bryant Chucking Grinder Co., Springfield, Vt. Specifications of the Nos. 16–16, 16–A, 16–28, and 16–38 grinders are included.

GRINDING AND BORING MACHINES "Precision Grinding & Boring Machines," a 106-page booklet offered by the Heald Machine Co., Worcester, Mass., describes and illustrates a complete line of internal and surface grinding machines.

GRINDING WHEELS The Norton Co., Worcester, Mass., has issued a three-page pamphlet showing instances which indicate the value of consulting engineering service to reduce grinding costs.

HAMMERS Bulletin No. 1275 published by Chambersburg Engineering Co., Chambersburg, Pa., describes the working of a new type pneumatic forging hammer.

HOB SHARPENERS A machine used for sharpening straight and helical shaped hobs and form cutters is described in Pamphlet No. 4, issued by Barber-Colman Co., Rockford, Ill.

HOISTS Catalog No. G-1 circulated by Coffing Hoist Co., Danville, Ill. illustrates the operating and construction features of hoists.

JIG GRINDER Marburg Bros. Inc., 90 West St., New York, N. Y. describes the operation of a precision jig grinder in a four-page folder.

LANDIS "The Story of Landis Tool Company," a 16-page illustrated booklet issued by Landis Tool Co., Waynesboro, Pa., discusses the company's history, progress and personnel.

LATHE OPERATION The Atlas Press Co., 1822 N. Pitcher St., Kalamazoo, Mich. has published a manual of lathe operation to provide authentic information for owners of lathes and other types of metal cutting machines.

LATHES The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio features the construction of a lightweight lathe in a 48-page booklet.

LATHES Three booklets issued by the Sidney Machine Tool Co., Sidney, Ohio, describe construction and operation features of toolroom lathes.

LATHES Catalog No. 50, published by South Bend Lathe Works, 226 E. Madison St., South Bend, Ind., contains 48 pages of information concerning the 9-in. "Workshop" precision lathes.

LEATHER BELTING A 24-page booklet offered by the Chicago Belting Co., 113–125 N. Green St., Chicago, Ill., discusses the economic operation of leather belting in power transmission.

LEATHER BELTING Two folders circulated by J. E. Rhoads & Son, 35 N. Sixth St., Philadelphia, Pa., sum up the advantages of Tannate flat leather belting for power transmission.

METAL SAWING Bulletin No. 50, published by the Peerless Machine Co., Racine, Wis. illustrates the contruction of a hydraulically operated metal sawing machine.

MILLERS New dial type milling machines, available in plain, universal and vertical types are fully described in a 28-page catalog, No. M-868, published by Cincinnati Milling Machine Co., Cincinnati, Ohio.

MILLING ATTACHMENTS Design, engineering and operating features of "All Angle" milling attachments, are provided in an eight-page illustrated bulletin offered by Fray Machine Tool Co., 515 W. Windsor Road, Glendale, Calif.

MILLING MACHINES The operation of high speed vertical milling machines is featured in a four-page folder published by Blank & Buxton Machinery Co., 620 N. Mechanic St., Jackson, Mich.

MOTORS Details of General-purpose universal motors made flat to occupy minimum space are provided in leaflet F-8494, available from Dept. 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MOTORS An 8-page illustrated folder No. GEA-2915A issued by the General Electric Co., Schenectady, N. Y., features the design and application of a new capacitor-motor.

OVENS Catalog No. 107, published by the Gehnrich Corp., Skillman Ave. and 35th St., Long Island City, N. Y., describes the operation and design of ovens and dryers for industrial heating processes.

PILLOW BLOCKS Bulletin No. A-325 issued by Dodge Mfg. Corp., Mishawaka, Ind., contains information covering their Dodge-Timken double interlock pillow block and selection tables.

PIPE TOOLS A 24-page booklet issued by Beaver Pipe Tools, Inc., 1940 Dana Ave., Warren, Ohio describes construction and lists prices and sizes of pipe tools.

PLUG GAGES "Pilot" cylindrical plug gages, a new product, are described in an illustrated 4-page bulletin offered by Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn.

PORTABLE TOOLS Black & Decker provides complete specifications of an extensive line of portable electric tools in its 64-page illustrated 1940 catalog.

PRESSES Operating features of double crank presses are outlined in Bulletin No. 64-F published by Niagara Machine & Tool Works, 637–697 Northland Ave., Buffalo, N. Y.

REAMERS Specifications of "Go & Go" hogging reamers are included in a 4-page illustrated folder, No. 108, offered by Goddard & Goddard Co., Detroit, Mich.

ROTARY MACHINE Bulletin No. 75-A issued by Niagara Machine & Tool Works, 637–697 Northland Ave., Buffalo, N. Y. includes illustrations of a complete line of machines for performing the varied operations in sheet metal shops and production requirements in the manufacture of metal products.

SCREW DRIVERS Booklet No. 135, circulated by Stanley Tools, New Britain, Conn. presents an illustrated description of a wide variety of screw drivers for industrial use.

SCREW-MACHINE TOOLS Brown & Sharpe Mfg. Co., Providence, R. I., has published an 84-page illustrated loose-leaf catalog providing specifications and operating recommendations for an extensive line of screw-machine tools.

SCREWS The Bristol Co., Waterbury, Conn., notes prices and sizes of screws with the multiple-spline design in Bulletin No. 840.

SHELL FORGING Baldwin-Omes shell forging presses, which are made in three sizes for shells from 40 to 180 mm., are described in Bulletin No. 110 offered by Baldwin Southwark Div., The Baldwin Locomotive Works, Philadelphia, Pa. These presses are manufactured under exclusive license from Omes-Continental, Holland, and readily can be converted to standard universal forging machines.

SHELL MACHINES Bulletins published by The Prescott Co., Menominee, Mich., describe the Nos. 21 and 23 "Amalgamated" shell turning machines designed by Lucien I. Yeomans. The No. 21 machine will swing 13 in. over the former carriage and has a carriage travel of 39 in. The No. 23 machine swings 27½ in. over the ways and has a 44 in. carriage travel.

SOLDERING IRON Hexacon Electric Co., 161 W. Clay Ave., Roselle Park, N. J., has just published catalog No. 100 which illustrates and describes a complete line of electric soldering irons.

STEEL EQUIPMENT To describe a complete line of steel fabricating equipment Bulletins Nos. 49 and 50 have been published by Hannifin Mfg. Co., 621–631 So. Kolmar Ave., Chicago, Ill.

STEEL HARDENABILITY Bulletin Series No. 320 published by the University of Illinois Engineering Experiment Station, Urbana, Ill., and sold for 70 cents, contains information on the hardenability of carburizing steels.

STEEL PRODUCTS The 1940 Scully stock list and reference book containing 254 pages of information essential to users of steel products has been published by the Scully Steel Products Co., 2364 So. Ashland Ave., Chicago, Ill.

THREAD CUTTING Landis Machine Co., Inc., Waynesboro, Pa. offers a bulletin which describes the application of thread cutting die heads, thread cutting machines, and collapsible taps.

THREADING A folder now being distributed by Landis Machine Co., Waynesboro, Pa., illustrates many machines in the Landis line.

TURRET LATHES Jones and Lamson Machine Co., Springfield, Vt. provides a catalog which includes dimensional diagrams, photographs, and general descriptions of turret lathe tools.

V-BELTS B. F. Goodrich Co., Akron, Ohio, describes fractional-horsepower V-belt designs in a 24-page catalog section No. 2180.

V-BELTS Catalog Section No. 151, issued by Allis-Chalmers Mfg. Co., Milwaukee, Wis., provides engineering information on multiple V-belt drives.

WELDED CHAINS The American Chain & Cable Co., Inc., Bridgeport, Conn. has published a new edition of Catalog No. 365 on welded chains.

WELDING Lincoln Electric Co., Cleveland, Ohio, has issued a 6-page illustrated folder, Bulletin No. 427, entitled "How to Build Your Own Engine-Driven Welder."

WELDING Bulletin No. GEA-3313, issued by General Electric Co., Schenectady, N. Y., provides 8 pages of information concerning the No. CR7503-G weld recorder for use with spot-welders.

WELDING A guide to the welding of commonly used metals has been printed in Chart No. 4464 by Linde Air Products Co., 30 E. 42nd St., New York, N. Y.

WELDING Welder Specification Bulletin No. 336, issued by Lincoln Electric Co., Cleveland, Ohio, contains 4 pages illustrating construction and use of the 200-amp. "Shield-Arc Junior" engine-driven welder.

WELDING ACCESSORIES A 4-page bulletin, No. CE-10, describing weld-

ing helmets and other accessory protective equipment, has been made available by Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh, Pa.

WELDING CONTROL A four-page folder No. F-8451-A, circulated by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., describes a method, without movable parts, to control resistance welding.

NEW BOOKS

TRAINING PROCEDURE—*By Frank Cushman, consultant in vocational procedure, Federal Security Agency, U. S. Office of Education. 229 pages. John Wiley & Sons, 440 Fourth Ave., New York. $2.50.*

The growing demand for skilled men in many branches of industry together with the continuance of a high degree of unemployment has suggested to many that the answer may be found in vocational training. Consequently, the book is timely.

Mr. Cushman's volume deals specifically with the training of employed personnel. He does not attempt to minimize the benefits of trade schools or other means of affording broad educational opportunities, but in order to treat more fully one angle of the subject, he limits his topic to improvement in the performance of work.

The author treats his subject logically. He starts with the planning and organization of training classes. He discusses the putting-over stage, during which the plans are translated into action. He outlines the means of appraising the results of a training program, and in realizing these results into manufacturing improvements. Lastly, he describes the need of maintaining the gains thus achieved. Too many programs, for one reason or another, tend to slump. This danger can only be avoided by stimulating a continuity of interest.

Mr. Cushman's work is designed not only for those in immediate charge of training programs, but for executives responsible for company policies upon which such activities depend.

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TURRET LATHE OPERATOR'S MANUAL—*By W. K. Bailey and J. R. Longstreet. 240 pages. Published by The Operators' Service Bureau of the Warner & Swasey Co., Cleveland, Ohio. $2.50.*

Written especially to help the operator of a turret lathe to do a better job with less effort, this book outlines methods, short cuts and suggestions which were compiled by men who have spent a large part of their lives with turret lathes. It has been written expressly for the man in the shop, is easy to read and easy to understand. There are more than 360 illustrations, including many detailed drawings. Incorporated as an appendix is a data section giving recommended speeds and feeds for turret lathes, tool angles for both high speed steel cutters and carbide cutters, as well as much information on standard thread sizes.

The addition of a turret to the metal turning lathes some 90 years ago made it possible to machine identical parts without constantly changing cutters. Since that time many improvements have been made in the basic design of turret lathes, as well as in tools and tool holders available for use on both job-lot and mass production work. Of particular interest in this book is a discussion, in the latter chapters, of permanent tooling set-ups for bar work and for chucking work. These set-ups are arranged so that the large and heavy tools are permanently mounted in their logical order on the machine. If necessary, for certain jobs, the tool stations can be back-indexed, or skip-indexed, to suit the requirements of the job, but the flanged tools themselves are not changed from one turret face to another. Ordinarily, the extra machine-handling time required to skip-index is less than the time that would be required to remove these tools from the machine, or to change their position on the turret. The lighter tools in the universal set can be arranged in various combinations to adapt the tools in the permanent set-up to each particular job as it comes along.

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DICTIONARY OF METALS & THEIR ALLOYS—*Edited by F. J. Camm, editor Practical Engineering. 245 pages. Distributed by The Chemical Publishing Co., 148 Lafayette St., New York, N. Y. $3.*

Cross-indexed for ready reference, this dictionary of metals and their alloys contains descriptions of the metals, their compositions and characteristics. The book includes information about practically every known metal, and almost every type of commercial metallic alloy. Where necessary, historical facts have been included in the text. The dictionary is supplemented with special sections on plating, polishing, hardening and tempering, metal-spraying, rust-proofing, chemical coloring and useful tables.

Written in England, this dictionary contains references to many European alloys not in common use in the United States. Where the spelling of the name of a metal is different in the United States and in England, both spellings are shown.

This book should be especially valuable to those engineers, production supervisors and purchasing agents who must be familiar with all metals and their alloys, particularly when references sometimes must be made to European designations.

OXY-ACETYLENE WELDING FOR BEGINNERS—*By J. W. Giachino. The Manual Arts Press, Peoria, Ill. 96 pages. $1.48.*

As indicated by the title, this book is distinctly for the beginning student of welding. The series of 23 lessons represents the scope of work which must be mastered before one can become an expert welder. Each is accompanied by brief explanations of needed apparatus, safeguards, use of tools and methods of procedure, followed by questions which clinch the information presented in the given lesson. Lessons are arranged to be carried out in the order presented. In addition to the lessons, the book contains seventeen projects to give the student an opportunity to apply his knowledge of welding to a practical purpose. An abundance of clear illustrations aids greatly in presenting the information.

TO THE EDITOR

Not All Youth's Fault

Dear Sir:

Your interesting editorial "On High-Nosing the Dirty Worker" is worthy of comment. To all of us who have served our time in the shop, the term "mill worker" is preferable, as cleanliness is a most important attribute in things mechanical. To me, nothing smells cleaner than a well-kept shop under full production. To the mill worker who is interested in his job, it is just like the smell of the sawdust ring to the circus lover . . .

Speaking of high-nosing the mill worker, I do not believe that youth is altogether at fault. What we need is to establish greater confidence in business through the general public; to invest more capital; to utilize invention and discovery to invigorate business and thereby create more jobs so that the young fellow of today can have an opportunity to serve his time in the shop with the older, more experienced workman. The youth has something the older workman needs, and so with the older worker. Through this medium, better employee relationships can be set up by promoting loyalty to one another as well as to the employer.

There are many fathers who hope their sons will have a better chance than they had. Let's give the youth of today that better chance. This is the way we can help create the great men you mention and many more Edisons and Ketterings. Genius is only great patience, but will die without opportunity.

Sincerely yours,
H. M. BRIGHTMAN
Assistant to President
Columbia Steel & Shafting Company
Pittsburgh, Pa.